PRINTRONIX®

Maintenance Manual

The Printronix P5000 series of Line Matrix Printers

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Maintenance Manual

PRINTRONIX®

164253-001, Rev D

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Dieses Gerät erfüllt die Bedingungen der EN 55022 Klasse A. Für diese Klasse von Geräten gilt folgende Bestimmung nach dem EMVG:

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(Auszug aus dem EMVG vom 9.Nov.92, Para.3, Abs.4)

Hinweis: Dieses Genehmigungsverfahren ist von der Deutschen Bundespost noch nicht veröffentlict worden.

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

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1 *Maintenance Overview*

About the Printer

Printronix® P5000 series line matrix printers use PSA™ (Printronix System Architecture), which puts all data control and printer control logic on one circuit board. The use of flash memory on this board permits rapid access to stored printer emulations and fast processing of print data. A variable-speed shuttle and half-step paper control enable these printers to print a wide variety of high-volume jobs with minimum maintenance and maximum reliability.

Although technologically advanced, the P5000 printer is easy to use. The operator can select every printer function at the printer control panel or by sending control codes in the data stream from the host computer to the printer. For greater security and to protect special printer configurations, the operator can program which key combination locks and unlocks the ENTER key on the control panel.

This is also an excellent graphics printer, with optional features that simplify the creation of images. The IGP® and Code V™ Printronix emulations, for example, are simple but versatile graphics programming languages that load into flash memory.

P5000 Printers

The P5000 family consists of machines that print at different speeds. (See Table 1.) Many models are available in either a floor cabinet or pedestal housing. P5XKA (Kanji/Hanzi) models are available in pedestal, cabinet, or “table top” configuration. Despite its name, the table top P5XKA printer is not intended for use on a table. It is really a pedestal model printer that has been removed from the pedestal and packaged separately to facilitate shipping to certain international markets. A “table top” printer is then installed on its pedestal after it arrives at its destination.

Kanji/Hanzi Printers

P5XKA printers have shuttle assemblies, hammer springs, and software modified to print the Kanji/Hanzi character sets used in Asia. These printers support the GB Song and GB Kai character sets used in the People’s Republic of China, Singapore, and Hong Kong, and the Big-5 Ming character set used in Hong Kong and Taiwan. P5XKA printers can mix ASCII and Kanji/Hanzi characters on the same line, with ASCII characters occupying half the width of Kanji/Hanzi character cells. Because of the density and complexity of these character sets, these models print at lower speeds.

Printer Evolution

The newest models in the family are the P5X05B, P5X10, and P5X15, which are available both in pedestal and floor cabinet housings. These models have a redesigned shuttle frame assembly, hammer bank, and ribbon guides. The new shuttle and hammer bank assemblies are not compatible with earlier P5000 printers, but the new ribbon guides can be used on any model P5000 printer.

The P5X05B, P5X10, and P5X15 models also use the CMX 040 controller board, which has a 40 MHz clock speed for the Data Controller unit. The CMX 040 can be used in any P5000 printer, but the P5X05B, P5X10, and P5X15 models cannot use earlier versions of the CMX board.

When you replace components, be careful to order the correct spares for the model you are servicing. The next section explains how to identify a P5000 series printer.

How to Identify the Printer

A P5000 printer is identified by its model number. The model number is a code that indicates the printer type, family, speed, and housing. Figure 1 shows how to interpret a model number.

Table 1 lists the models comprising the P5000 family. The speeds listed in Table 1 are the highest speeds attainable under controlled conditions. Actual printing speed is determined by the interaction of many variables. For more information about printing speeds, refer to “Printing Rates” on page 242.

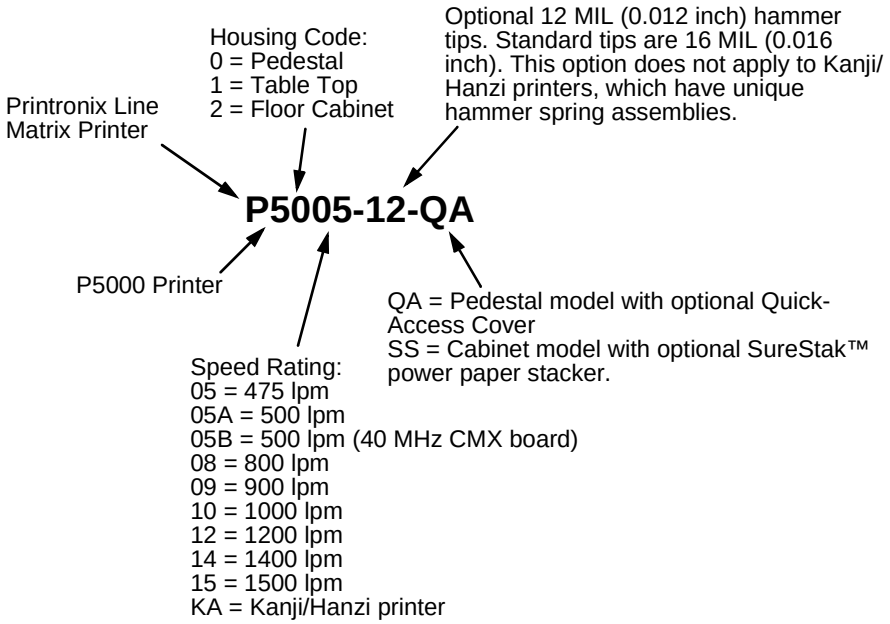

Housing Code:
0 = Pedestal
1 = Table Top
2 = Floor Cabinet
Optional 12 MIL (0.012 inch) hammer tips. Standard tips are 16 MIL (0.016 inch). This option does not apply to Kanji/ Hanzi printers, which have unique hammer spring assemblies.
Printronix Line Matrix Printer
P5005-12-QA
P5000 Printer
QA = Pedestal model with optional Quick-Access Cover
SS = Cabinet model with optional SureStak™ power paper stacker.
Speed Rating:
05 = 475 lpm
05A = 500 lpm
05B = 500 lpm (40 MHz CMX board)
08 = 800 lpm
09 = 900 lpm
10 = 1000 lpm
12 = 1200 lpm
14 = 1400 lpm
15 = 1500 lpm
KA = Kanji/Hanzi printer

Figure 1. How to Interpret Model Numbers

Table 1. P5000 Printers

Model Number	Print Speed	Enclosure	Hammer Bank	Data Controller Clock Speed[1]
P50KA™	585 lpm	Pedestal	91 Hammers Kanji / Hanzi	25 MHz
P5005™	475 lpm	Pedestal	28 Hammers	25 MHz
P5005-QA™	475 lpm	Pedestal w/Quick-Access Cover	28 Hammers	25 MHz
P5005-12™	475 lpm	Pedestal	28 Hammers, 12 MIL tips	25 MHz
P5005-12-QA™	475 lpm	Pedestal w/Quick-Access Cover	28 Hammers, 12 MIL tips	25 MHz
P51KA™	585 lpm	Table Top	91 Hammers Kanji / Hanzi	25 MHz
P5205™	475 lpm	Cabinet	28 Hammers	25 MHz
P5205-12™	475 lpm	Cabinet	28 Hammers, 12 MIL tips	25 MHz
P5005A™	500 lpm	Pedestal	28 Hammers	25 MHz
P5005A-QA™	500 lpm	Pedestal w/Quick-Access Cover	28 Hammers	25 MHz
P5005A-12™	500 lpm	Pedestal	28 Hammers, 12 MIL tips	25 MHz
P5005A-12-QA™	500 lpm	Pedestal w/Quick-Access Cover	28 Hammers, 12 MIL tips	25 MHz
P5205A™	500 lpm	Cabinet	28 Hammers	25 MHz
P5205A-12™	500 lpm	Cabinet	28 Hammers, 12 MIL tips	25 MHz
P5005B™	500 lpm	Pedestal	28 Hammers	40 MHz
P5005B-QA™	500 lpm	Pedestal w/Quick-Access Cover	28 Hammers	40 MHz
P5005B-12™	500 lpm	Pedestal	28 Hammers, 12 MIL tips	40 MHz
P5005B-12-QA™	500 lpm	Pedestal w/Quick-Access Cover	28 Hammers, 12 MIL tips	40 MHz
P5205B™	500 lpm	Cabinet	28 Hammers	40 MHz

Table 1. P5000 Printers

Model Number	Print Speed	Enclosure	Hammer Bank	Data Controller Clock Speed[1]
P5205B-12™	500 lpm	Cabinet	49 Hammers, 12 MIL tips	40 MHz
P5008™	800 lpm	Pedestal	49 Hammers	25 MHz
P5008-QA™	800 lpm	Pedestal w/Quick-Access Cover	49 Hammers	25 MHz
P5208™	800 lpm	Cabinet	49 Hammers	25 MHz
P500™	900 lpm	Pedestal	49 Hammers	25 MHz
P5009-QA™	900 lpm	Pedestal w/Quick-Access Cover	49 Hammers	25 MHz
P5209™	900 lpm	Cabinet	49 Hammers	25 MHz
P5010™	1000 lpm	Pedestal	60 Hammers	40 MHz
P5010-QA™	1000 lpm	Pedestal w/Quick-Access Cover	60 Hammers	40 MHz
P5210™	1000 lpm	Cabinet	60 Hammers	40 MHz
P5212™	1200 lpm	Cabinet	91 Hammers	25 MHz
P5214™	1400 lpm	Cabinet	91 Hammers	40 MHz
P5214-SS™	1400 lpm	Cabinet w/SureStak Paper Stacker	91 Hammers	40 MHz
P5015™	1500 lpm	Pedestal	102 Hammers	40 MHz
P5015-QA™	1500 lpm	Pedestal w/Quick-Access Cover	102 Hammers	40 MHz
P5215™	1500 lpm	Cabinet	102 Hammers	40 MHz
P5215-SS™	1500 lpm	Cabinet w/SureStak Paper Stacker	102 Hammers	40 MHz
P52KA™	585 lpm	Cabinet	91 Hammers Kanji / Hanzi	40 MHz

[1] The microprocessor of the Data Controller unit on the CMX controller board runs at 25 MHz or 40 MHz, depending on printer model. This means there are two kinds of CMX controller board for these printers, used as indicated in Table 1. The 40 MHz controller board, however, is compatible with all models that use the 25 MHz board and should be used if the CMX board is replaced.

Important Maintenance Notes

To ensure the best performance of the printer, remember these maintenance principles whenever you service the printer.

CAUTION **Failure to observe these guidelines can result in damage to the equipment.**

- Do not adjust the platen gap unless
  1) the original shuttle frame assembly or platen has been replaced with a new or rebuilt unit, or
  2) you are instructed to do so in a troubleshooting procedure.
- Never bend or tweak hammer springs. Always handle hammer springs by the thick mounting base. The hammer springs and hammer tips are delicate and precisely aligned.
- Use only the ribbons specified in Appendix B. Use of incorrect ribbons can lead to ink migration problems, degraded print quality, and expensive damage to the printer.
- Do not close the forms thickness lever too tightly. Closing the forms thickness lever too tightly can lead to smearing, degraded print quality, paper jams, and damage to the platen and shuttle assembly.

About This Manual

This is a field service maintenance manual. It is designed so that you can locate maintenance information quickly.

This manual does not explain how to install, operate, or configure the printer. That information is in the *User's Manual.*

This manual does not explain how to program application software for operation with the printer. Programming information for the protocols used by the printer is in the appropriate programmer's reference manual:

- *LinePrinter Plus® Programmer's Reference Manual*
  Defines host control codes for the LinePrinter Plus emulations.
- *Character Sets Reference Manual*
  Information about and examples of the character sets available in Printronix line matrix printers.
- *Network User's Manual*
  Information about network protocols, configuration, and network operation.
- *Coax/Twinax Programmer's Reference Manual*
  Defines host control codes and character sets for the optional coax/twinax emulations.
- *ANSI® Programmer's Reference Manual*
  Defines host control codes and character sets for the ANSI emulation.
- *IPDS™ Twinax Emulation Programmer's Reference Manual*
  An overview of Intelligent Printer Data Stream™ (IPDS) features, commands, and diagnostics.

- *IGP/PGL® Programmer's Reference Manual*
  Describes the optional IGP Printronix emulation. The IGP Printronix emulation allows the user to create and store forms; generate logos, bar codes, and expanded characters; create other graphics, and merge graphics with alphanumeric data as a document is printed.
- *IGP/VGL Programmer's Manual*
  Describes the optional Code V Printronix emulation. The Code V Printronix emulation allows the user to create and store forms; generate logos, bar codes, and expanded characters; create other graphics, and merge graphics with alphanumeric data as a document is printed.

How to Use This Manual

1. Find the procedure or information you need in the Table of Contents or the Index.
2. Read the entire procedure before you work on the printer.
3. Gather the parts and tools you will need.
4. Make sure you understand all safety notices before you start a task. (See below.)

Notes and Notices

For your safety and to protect valuable equipment, read and comply with all information highlighted under notes and notices. The heading of a notice indicates the kind of information it contains:

WARNING **Conditions that could hurt you and damage equipment.**

CAUTION **Conditions that could damage equipment.**

IMPORTANT **Information vital to proper operation and maintenance of the printer.**

NOTE: Notes contain tips for efficient operation, maintenance, and troubleshooting.

IMPORTANT **The Safety Notices on page 17 apply at all times when you are working on the printer. Please read them now.**

Printing Conventions in This Manual

Control panel keys and indicators are highlighted in **UPPERCASE BOLD PRINT**.
Example: Press the **CANCEL** key, then press the **ON LINE** key.

LCD (Liquid Crystal Display) messages are set off by quotation marks (" ").
Example: Press the **ON LINE** key**.** "OFF LINE" appears on the LCD.

Control panel key combinations are indicated by the **+** (plus) symbol.
Example: Press ▲ + ▼.
means Press the ▲**(UP)** key and the ▼**(DOWN)** key at the same time.

Safety Notices

WARNING **Always disconnect the AC power cord from the printer or power source before performing any maintenance procedure. Failure to remove power could result in injury to persons or damage to equipment. If you must apply power during maintenance, you will be instructed to do so in the maintenance procedure.**

WARNING **Always disconnect the AC power cord before cleaning the printer.**

WARNING **To prevent injury from electric shock, wait at least one minute after shutting off power before removing the power supply circuit board. Wear a properly grounded static wrist strap when handling the power supply board. Handle the board by the sides. Do not touch components or flex the board during removal/installation.**

WARNING **Over time, the upper edge of the paper ironer can become sharp. To avoid cutting yourself, handle the paper ironer on the sides.**

WARNING **Hold the printer cover securely while disengaging the gas spring assembly.**

Hinweise zur Sicherheit

VORSICHT

Bevor Sie anfällige Wartungsarbeiten durchführen, müssen Sie zuerst immer das Netzkabel aus der Steckdose ziehen. Wird das Netzkabel nicht herausgezogen, können Verletzungen oder Geräteschäden entstehen. Falls die Wartungsarbeit Stromzufuhr erfordert, wird im Wartungsablauf darauf hingewiesen.

VORSICHT

Ziehen Sie das Netzkabel aus der Steckdose, bevor Sie den Drucker reinigen.

VORSICHT

Um Verletzungen durch Elektroschocks zu vermeiden, warten Sie mindestens eine Minute nach Stromausschaltung, bevor Sie die elektrische Schaltkarte entfernen. Bitte immer einen geerdeten, statischen Handgelenkriemen tragen, wenn Sie die elektrische Schaltkarte handhaben. Halten Sie die Karte nur an den seitlichen Auswurfshebeln. Während des Herausnehmens/Installierens dürfen die Komponenten der Karte nicht berührt oder gebogen werden.

VORSICHT

Die obere Kante der Papierschiene wird mit der Zeit scharf. Halten Sie die Schiene deshalb an den Seiten, damit Sie sich nicht schneiden.

VORSICHT

Behalten Sie die Druckerabdeckung sicher im Griff, wenn Sie das Gasfederpaket entfernen.

Controls and Indicators

Electrical Controls and Indicators, Cabinet Models (Figure 2)

Switch or Indicator	Function	Active On-line	Active Off-line
Power Switch	Turns printer on and off: 1 = on, 0 = off. This switch is also a circuit breaker.		
Status Indicator	On when the printer is on-line, off when the printer is off-line. Flashes to indicate a fault or warning.	✓	✓
LCD	Liquid Crystal Display. Displays printer status messages, fault messages, and menus which permit user to set various configurations.	✓	✓
ON LINE/ CLEAR	Toggles the printer on-line and off-line. Clears the printer after a fault is corrected and returns the printer to off-line state.	✓	✓
PAPER ADVANCE	Prints any data in the buffer then moves paper up one line at the currently active line spacing. If pressed longer than 1/2 second, moves paper to the next Top Of Form as defined by the currently active form length.	✓	✓
VIEW / EJECT	Moves the current print position to the tractor area for viewing. When paper is in VIEW position, “Printer in View” displays and microstep adjustment feature is active. (See UP and DOWN keys.) Holding key down for more than 1/2 second invokes EJECT and paper is advanced two pages. (EJECT can be disabled via the menus.) Pressing key a second time moves paper back to the print position from either VIEW or EJECT position.	✓	✓
CANCEL	Clears all data from the print buffer (if enabled in the MAINT/MISC menu).		✓
▲ (UP)	Displays next higher level of a configuration menu. In VIEW mode, moves paper up 1/72 inch. (See VIEW / EJECT key.)	✓	✓
▼ (DOWN)	Displays next lower level of a configuration menu. In VIEW mode, moves paper down 1/72 inch. (See VIEW / EJECT key.)	✓	✓
▶ (NEXT)	Displays the next option in a configuration menu.		✓
◀ (PREV)	Displays the previous option in a configuration menu.		✓
SET TOF	Moves paper downward from TOF alignment mark to the print station and sets this as the first line of print on a page, independent of forms length. If there are data in the buffers, the printer slews to the page position where printing left off and prints the data.		✓
PRT CONFIG	Prints the current printer configuration.		✓
JOB SELECT	Allows fast selection of any stored configuration. Repeated pressing scrolls through all saved configurations. Press ENTER to select the displayed configuration. (ENTER does not have to be unlocked for this function.)		✓
ENTER	Enters an option displayed on the LCD into printer non-volatile memory. Starts and stops printer tests, sets a value, or prints the configuration. This key is locked and unlocked by a user-selectable key combination. (Refer to the *User’s Manual*.)		✓
◀+▶	Resets the printer by reloading the power-up configuration and resetting the internal state.		

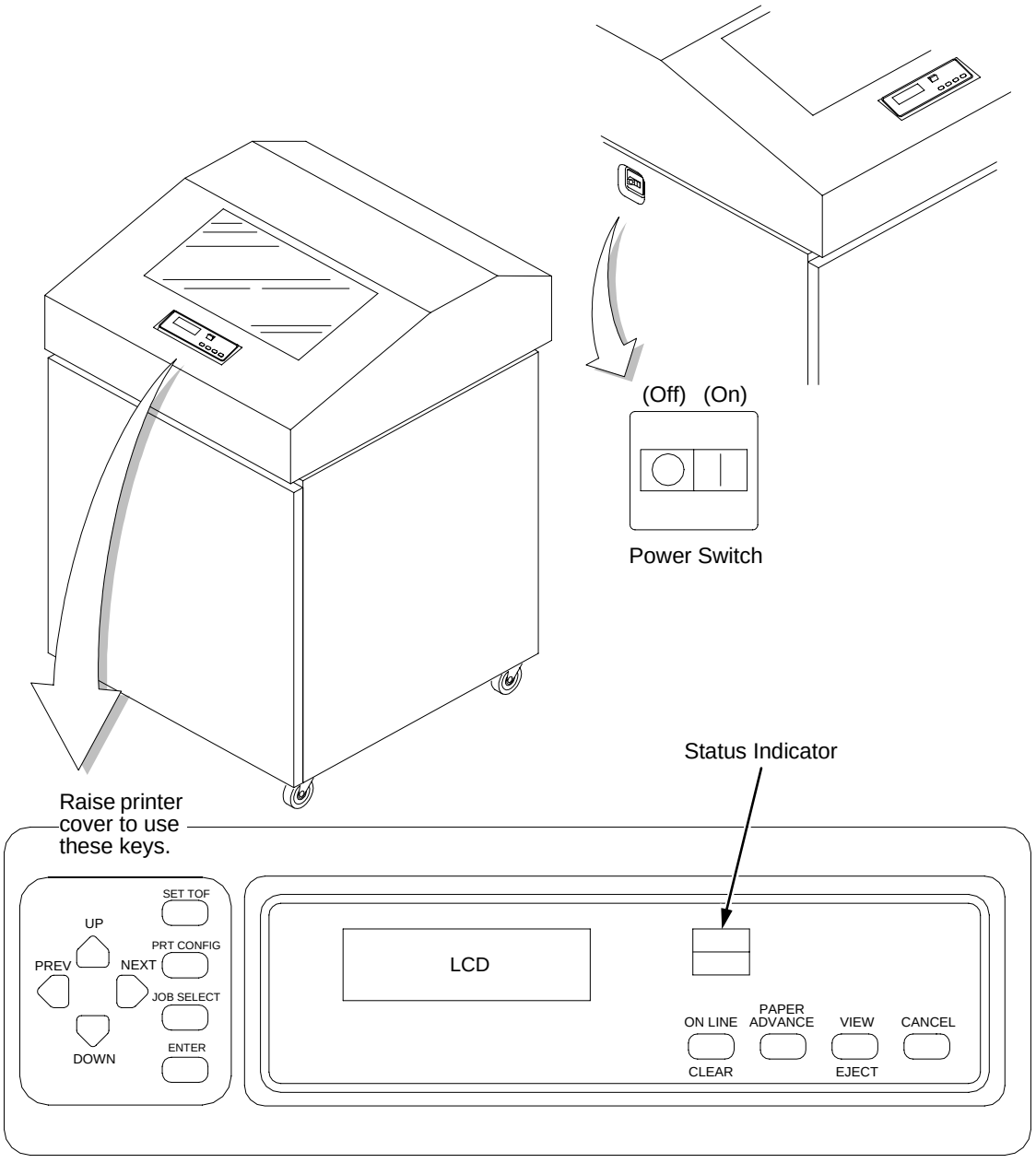


Figure 2. Electrical Controls, Cabinet Models

Electrical Controls and Indicators, Pedestal Models (Figure 3)

Switch or Indicator	Function	Active On-line	Active Off-line
Power Switch	Turns printer on and off: 1 = on, 0 = off. This switch is also a circuit breaker.		
Status Indicator	On when the printer is on-line, off when the printer is off-line. Flashes to indicate a fault or warning.	✓	✓
LCD	Liquid Crystal Display. Displays printer status messages, fault messages, and menus which permit user to set various configurations.	✓	✓
ON-LINE CLEAR	Toggles the printer on-line and off-line. Clears the printer after a fault is corrected and returns the printer to off-line state.	✓	✓
PAPER ADVANCE	Prints any data in the buffer then moves paper up one line at the currently active line spacing. If pressed longer than 1/2 second, moves paper to the next Top Of Form as defined by the currently active form length.	✓	✓
VIEW EJECT	Moves the current print position to the tractor area for viewing. When paper is in VIEW position, “Printer in View” displays and microstep adjustment feature is active. (See UP and DOWN keys.) Holding key down for more than 1/2 second invokes EJECT and paper is advanced two pages. (EJECT can be disabled via the menus.) Pressing key a second time moves paper back to the print position from either VIEW or EJECT position.	✓	✓
CANCEL	Clears all data from the print buffer (if enabled in the MAINT/MISC menu).		✓
↑ UP	Displays next higher level of a configuration menu. In VIEW mode, moves paper up 1/72 inch. (See VIEW / EJECT key.)	✓	✓
↓ DOWN	Displays next lower level of a configuration menu. In VIEW mode, moves paper down 1/72 inch. (See VIEW / EJECT key.)	✓	✓
→ NEXT	Displays the next option in a configuration menu.		✓
← PREV	Displays the previous option in a configuration menu.		✓
SET TOF	Moves paper downward from TOF alignment mark to the print station and sets this as the first line of print on a page, independent of forms length. If there are data in the buffers, the printer slews to the page position where printing left off and prints the data.		✓
PRT CONFIG	Prints the current printer configuration.		✓
JOB SELECT	Allows fast selection of any stored configuration. Repeated pressing scrolls through all saved configurations. Press ENTER to select the displayed configuration. (ENTER does not have to be unlocked for this function.)		✓
ENTER	Enters an option displayed on the LCD into printer non-volatile memory. Starts and stops printer tests, sets a value, or prints the configuration. This key is locked and unlocked by a user-selectable key combination. (Refer to the *User’s Manual*.)		✓
← + →	Resets the printer by reloading the power-up configuration and resetting the internal state.		

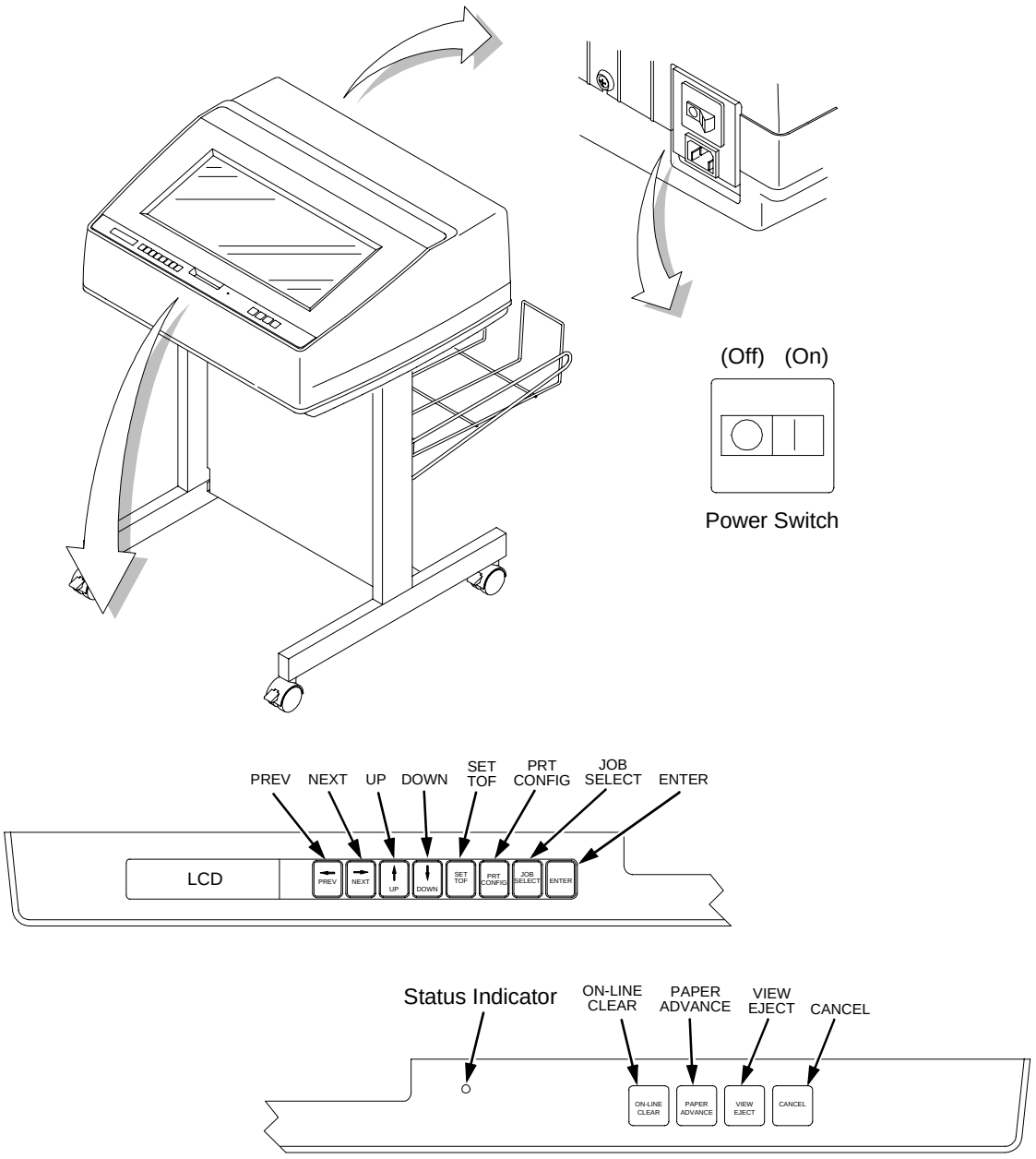
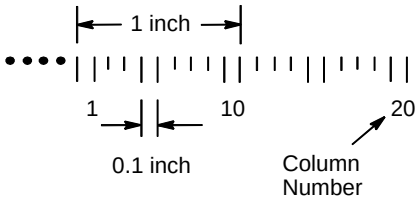


Figure 3. Electrical Controls, Pedestal Models

Mechanical Controls and Indicators, All Models (Figure 6)

Control or Indicator	Function
Forms Thickness Lever	Sets the platen for paper and forms of different thicknesses. Lever must be fully opened (raised) to load or unload paper.
Paper Supports	Help prevent paper jams by supporting inner sections of paper. They are positioned manually by sliding them along the shafts.
Forms Thickness Pointer and Scale	Indicates relative thickness of forms and paper. Set this lever at A for thin (single-part) forms, B for thicker forms, and so on.
Tractors (2)	Hold and feed paper. Used to set side margin and position paper horizontally.
Tractor Locks (2)	Lock tractors in position.
Horizontal Adjustment Knob	Allows fine positioning of left print margin. Moves paper and tractors left or right.
Vertical Position Knob	Used to set top of form or first line to be printed. Rotate this knob to move paper vertically. Works when forms thickness lever is open.
Ribbon Loading Path Diagrams	Instructions showing how to load the ribbon correctly. One diagram is cast in relief on the shuttle cover, and another is printed on the paper scale.
Paper Scale	A horizontal scale graduated in tenths of an inch, useful for setting paper margins counting text columns. (See below.)



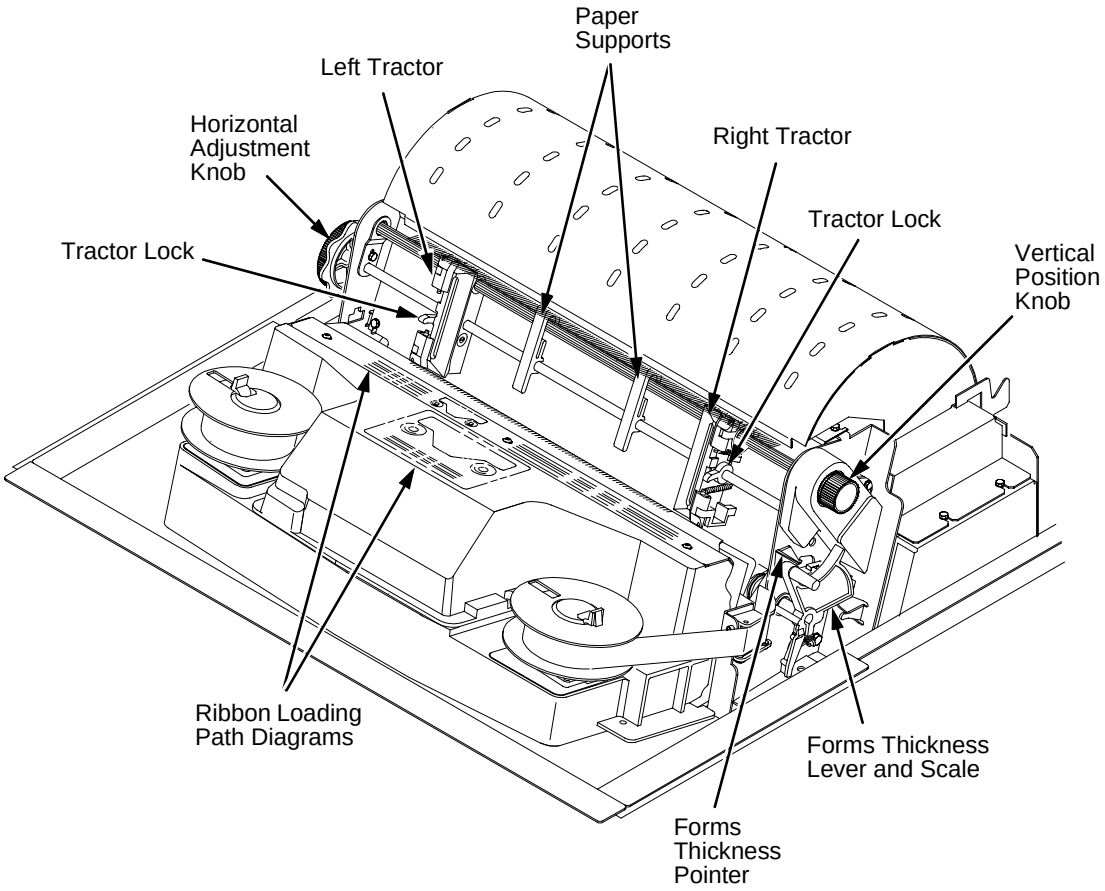


Figure 4. Mechanical Controls and Indicators, All Models

Tools, Test Equipment, and Supplies

For field level maintenance of the printer, you will need these tools:

- Adapter, 1/4 in. hex to 1/4 in. square, Utica® HW-18
- Alcohol, anhydrous
- Allen Wrench, 1/16 inch
- Allen Wrench, 3/32 inch
- Allen Wrench, 7/64 inch
- Allen Wrench, 5/64 inch
- ESD Wrist Strap
- Feeler Gauge, .010 inch
- Feeler Gauge, .011 inch
- Feeler Gauge, .040 inch
- Force Gauge, (Chatillon™ NY, Gauge-r, 0-20 lb., CAT 719-20)
- Hex bit, 3/16 in., torque screwdriver
- Hex bit, 3/32 in., torque screwdriver
- Hex bit, 5/32 in., torque screwdriver
- Hex bit, 5/64 in., torque screwdriver
- Lubricant, Bearing (Printronix P/N 101805-001)
- Nut Driver, 1/4 inch
- Nut Driver, 5/16 inch
- Nut Driver or Open End Wrench, 7/32 inch
- Open End Wrench, 5/16 inch
- Pliers, Grip Ring, External
- Screwdriver, flat tip
- Screwdriver, Phillips, #1
- Screwdriver, Phillips, #2
- Screwdriver, Torque, Utica TS-35
- Tie Wraps, 4 inch
- Torx® T-10 Driver

2 *Preventive Maintenance*

Cleaning the Printer

The printer is designed to require very little maintenance. Aside from normal replenishment of paper and ribbons, the only preventive maintenance required is periodic cleaning.

Because operating conditions vary widely, the user must determine how often to clean the printer.

Since there is no guarantee that the user will clean the printer regularly, you should clean the printer whenever you are called to service it. The cleaning procedures in this chapter pertain to all models.

WARNING **Always disconnect the AC power cord before cleaning the printer.**

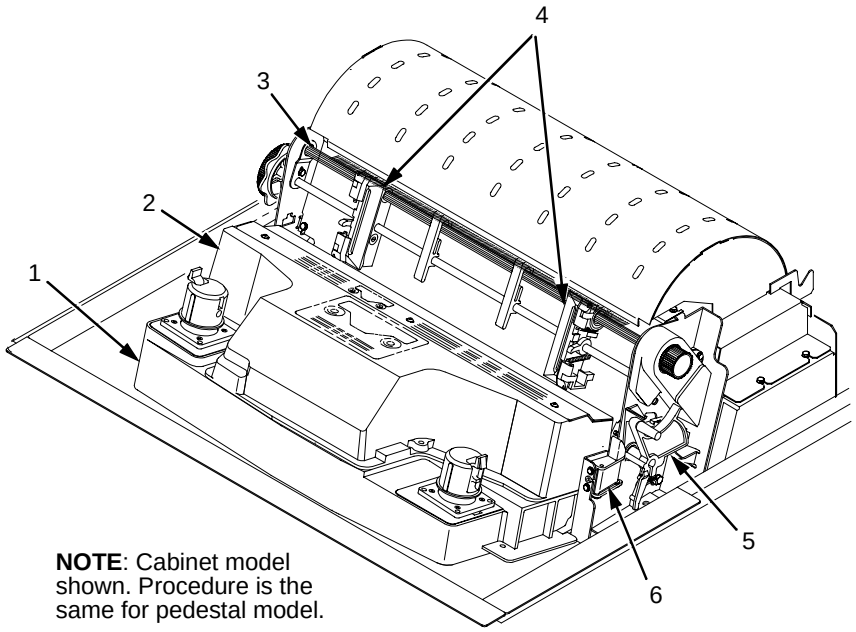
CAUTION **Do not use abrasive cleaners, particularly on the window.**
Do not drip water into the printer. Damage to the equipment will result.
Do not spray directly onto the printer when using spray solutions. Spray the cloth, then apply the dampened cloth to the printer.
Do not vacuum the circuit boards.

Cleaning the Outside Surfaces

1. Power off the printer.
2. Disconnect the AC power cord from the printer or the power source.
3. Remove paper and the ribbon.
4. Dampen a clean, lint-free cloth with water and a mild detergent or with window cleaning solution. The cloth must be damp, not wet. Wipe down the outside surfaces of the printer.
5. Dry the outside surfaces with a clean, lint-free cloth.
6. Open the printer cover.
7. Using a soft-bristled, non-metallic brush (such as a toothbrush), brush paper dust and ribbon lint off the tractors, shuttle cover assembly, base casting, and ribbon guides. Vacuum up the residue. (See Figure 5.)
8. Wipe the splined shaft with a soft cloth.

CAUTION **To avoid corrosion damage, use only alcohol when cleaning printer mechanical elements, and make sure the cleaning solution contains no water.**

9. Using a cloth dampened (not wet) with alcohol, clean the ribbon guides.
10. Vacuum up dust and residue from the lower cabinet.
11. Wipe the interior of the lower cabinet with a clean, lint-free cloth dampened with water and a mild detergent or window cleaning solution.
12. Dry the cabinet interior with a clean, lint-free cloth.
13. Clean the shuttle frame assembly, as described in the next section.



NOTE: Cabinet model shown. Procedure is the same for pedestal model.

Legend:

1) Base Casting
2) Shuttle Cover Assembly
3) Splined Shaft
4) Tractors
5) Forms Thickness Lever
6) Ribbon Guide

Figure 5. Cleaning Inside the Cabinet or Top Cover

Cleaning the Shuttle Frame Assembly

1. Remove the shuttle cover assembly (page 160).
2. Remove the shuttle frame assembly (page 198).
3. Remove the paper ironer (page 176).

WARNING **Over time, the upper edge of the paper ironer can become sharp. To avoid cutting yourself, handle the paper ironer on the sides.**

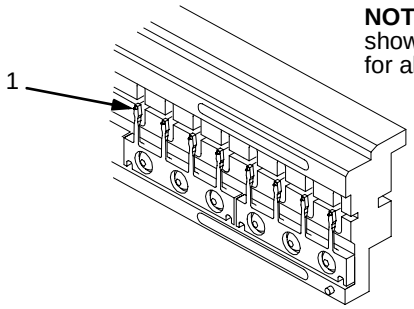
4. Moisten a clean, soft cloth with alcohol. Wipe the paper ironer to remove lint, ink, and paper residue.
5. Install the paper ironer (page 176).
6. Remove the hammer bank / ribbon mask cover assembly (page 157).

CAUTION **The ribbon mask is thin and easily bent. Be careful not to crease or kink the ribbon mask when handling and cleaning it.**

7. Moisten a clean, soft cloth with alcohol. Wipe the hammer bank cover and ribbon mask to remove lint, ink, and paper residue. Clean the holes in the cover strips. Carefully wipe between the hammer bank cover and the ribbon mask (early models).

CAUTION **Do not use any solvents or liquids to clean the hammer tips. Clean the hammer tips gently—too much pressure can chip them.**

8. Using a stiff, non-metallic brush (such as a toothbrush), gently brush the hammer tips to remove lint and ink accumulations. (See Figure 6.) Vacuum up any residue.



NOTE: P5005 hammer bank is shown. Procedure is the same for all hammer banks.

Legend:

1) Hammer Tip

Figure 6. Cleaning the Hammer Tips

CAUTION **The hammer bank contains a strong magnet. To prevent damage to the hammer tips, do not let the hammer bank cover assembly snap into place as the hammer bank magnet attracts it. Any impact of the cover against the hammer bank can break hammer tips.**

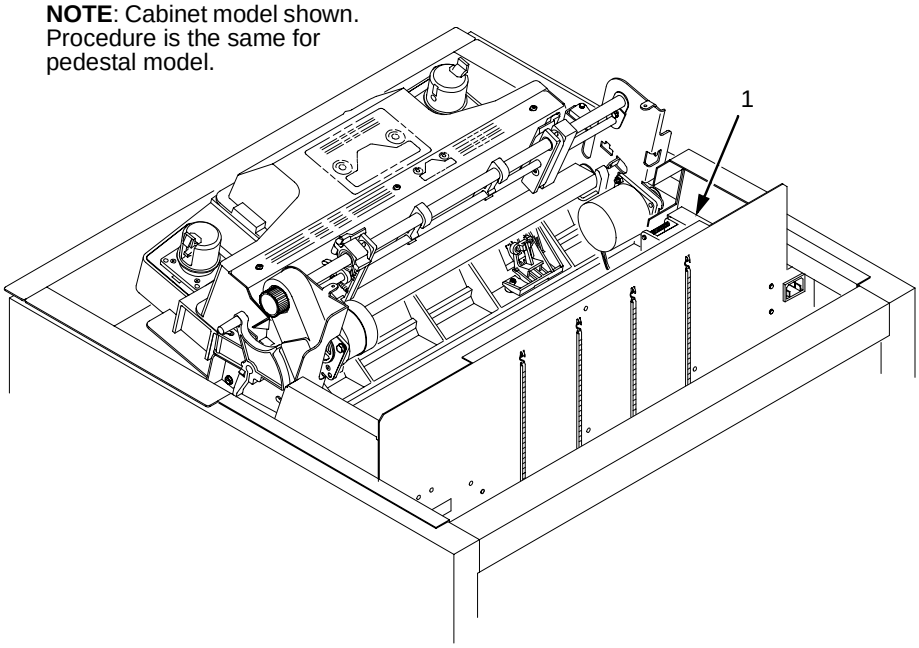
9. Install the hammer bank / ribbon mask cover assembly (page 157).
10. Install the shuttle frame assembly (page 198).

11. Install the shuttle cover assembly (page 160).
12. Clean the card cage fan assembly, as described in the next section.

Cleaning the Card Cage Fan Assembly

1. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
2. Vacuum the card cage fan assembly and surrounding areas to remove paper particles, dust, and lint. (See Figure 7.)
3. Cabinet Models: Install the paper path (page 177)
   Pedestal Models: Install the top cover assembly (page 161).
4. Return the printer to normal operation (page 107).

NOTE: Cabinet model shown. Procedure is the same for pedestal model.



Legend:

1) Card Cage Fan Assemb.y

Figure 7. Cleaning the Card Cage Fan Assembly

3 *Troubleshooting*

Introduction

This chapter lists fault messages and symptoms, and provides procedures for troubleshooting printer malfunctions.

Always have the *User's Manual* handy when you troubleshoot because this manual does not cover printer operation or configuration. You must operate the printer to check its performance, and sometimes you may have to reconfigure it.

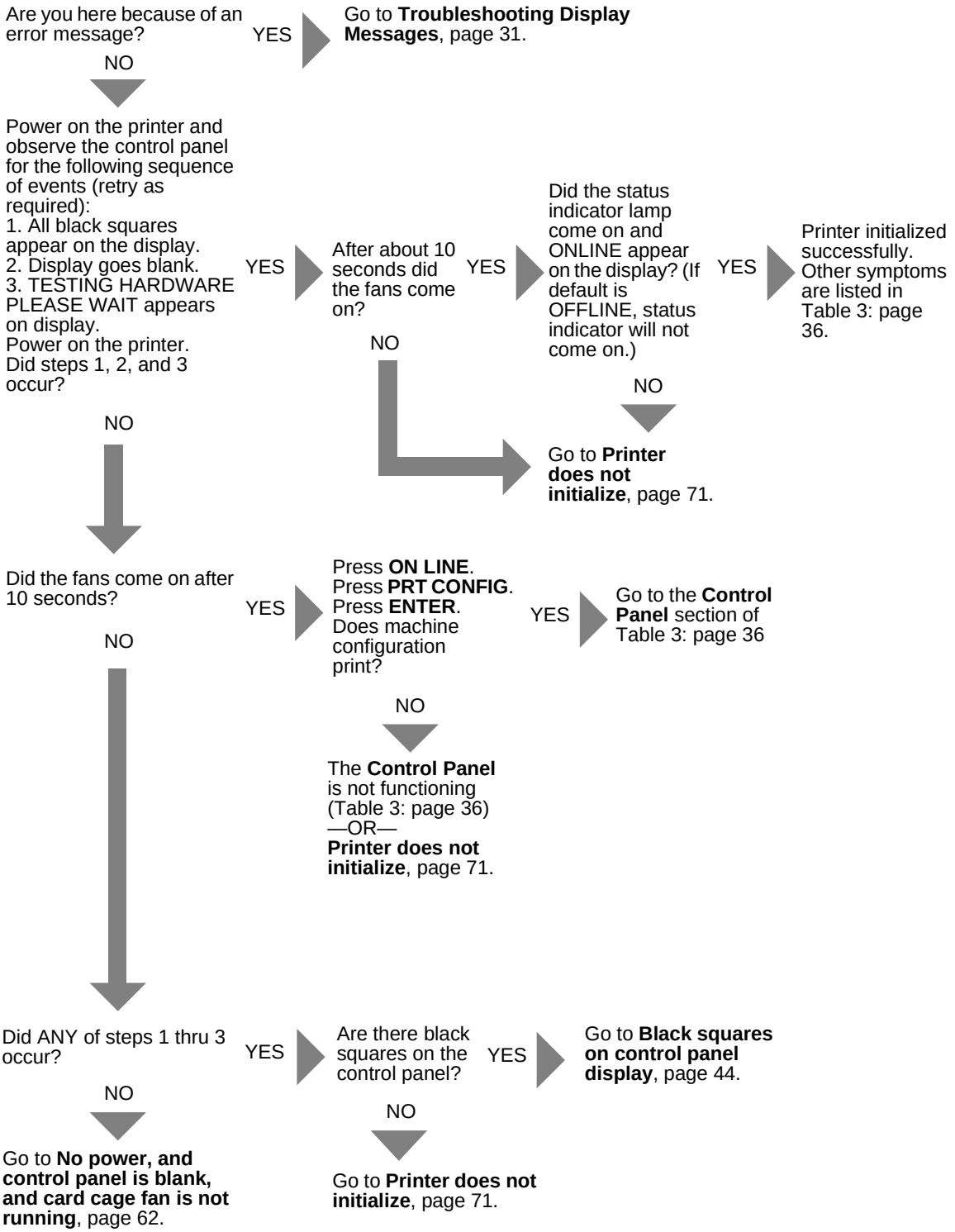
Troubleshooting Aids

Troubleshooting is faster and more effective if you understand the equipment and make use of all available tools.

This manual provides a number of troubleshooting aids to help you isolate printer malfunctions:

- **"Start Here" Logic Tree** **page 30**
- **Troubleshooting Display Messages** **page 31**
- **Message List** **page 31**
- **Troubleshooting Other Symptoms** **page 36**
- **General Symptom List** **page 36**
- **Troubleshooting Procedures** **page 38**
- **Diagnostic Printer Tests** **page 92**
- **Hex Code Printout** **page 95**
- **ASCII Character Set** **page 97**
- **The Power On Sequence** **page 99**
- **Appendix A: Wire Data** **page 259**

Start Here...


Are you here because of an error message?
YES
Go to **Troubleshooting Display Messages**, page 31.
NO
Power on the printer and observe the control panel for the following sequence of events (retry as required):
1. All black squares appear on the display.
2. Display goes blank.
3. TESTING HARDWARE PLEASE WAIT appears on display.
Power on the printer.
Did steps 1, 2, and 3 occur?
YES
After about 10 seconds did the fans come on?
YES
Did the status indicator lamp come on and ONLINE appear on the display? (If default is OFFLINE, status indicator will not come on.)
YES
Printer initialized successfully. Other symptoms are listed in Table 3: page 36.
NO
NO
Go to **Printer does not initialize**, page 71.
NO
Did the fans come on after 10 seconds?
YES
Press **ON LINE**.
Press **PRT CONFIG**.
Press **ENTER**.
Does machine configuration print?
YES
Go to the **Control Panel** section of Table 3: page 36
NO
The **Control Panel** is not functioning (Table 3: page 36)
—OR—
Printer does not initialize, page 71.
NO
Did ANY of steps 1 thru 3 occur?
YES
Are there black squares on the control panel?
YES
Go to **Black squares on control panel display**, page 44.
NO
NO
Go to **Printer does not initialize**, page 71.
Go to **No power, and control panel is blank, and card cage fan is not running**, page 62.

Troubleshooting Display Messages

WARNING **Always disconnect the AC power cord from the printer before doing a maintenance procedure. Failure to remove power could result in injury to you or damage to equipment. If you must apply power during maintenance, you will be instructed to do so in the maintenance procedure.**

Three kinds of messages appear on the Liquid Crystal Display (LCD):

- Status messages
- Configuration menus and menu options
- Fault messages

NOTE: Most fault messages are cleared from the LCD by correcting the fault condition and then pressing the **CLEAR** key. Fault messages that can only be cleared by shutting down and restarting the printer are indicated by an asterisk (*) appended to the message.

If printer logic detects a fault condition, three things happen:

- The status indicator on the control panel flashes on and off.
- The audible alarm beeps if it is enabled. Press CLEAR to silence the alarm.
- The control panel LCD displays a fault message.

How to Clear LCD Messages

Find the message in the **Message List** below, go to the troubleshooting procedure, and follow the numbered instructions. After correcting an error, press the **CLEAR** key to clear the message and place the printer in the off-line state.

If an error is not cleared, the printer will try to print again but will display the error message until the error is cleared.

Table 2: Message List

Symptom	Troubleshooting Procedure
06 HOST REQUEST	page 39
08 HOLD PRINT TIMEOUT	page 39
8.5V POWER FAIL *	page 39
15 COMM CHECK	page 39
15V CTL FAIL*	page 40
22 INVALID ADDR	page 40
23.5V CTL FAIL*	page 40

Table 2: Message List

Symptom	Troubleshooting Procedure
31 PAPER OUT TIMEOUT	page 41
32 PAPER JAM TIMEOUT	page 41
33 PLATEN OPEN TIMEOUT	page 42
34 RIBBON STALL TIMEOUT	page 42
48V PWR FAIL*	page 43
ACCESS NULL PTR*	page 43
ACTIVATE LOST	page 44
A TO D OVERRUN*	page 44
BUFFER OVERRUN	page 45
CLEAR PAPER JAM	page 46
CLEARING PROGRAM FROM FLASH	page 49
CLOSE PLATEN	page 49
COIL HOT	page 49
CTL VOLT FAIL*	page 51
DIAGNOSTIC PASSED	page 51
DRVR CIR BAD*	page 52
ERROR: DC PROGRAM NOT VALID	page 52
ERROR: DRAM AT ADDRESS XXXXXXXX	page 53
ERROR: EC PROGRAM NOT VALID	page 53
ERROR: EC STOPPED AT STATE XXXX	page 53
ERROR: FLASH DID NOT PROGRAM	page 53
ERROR: FLASH NOT DETECTED	page 54
ERROR: NO DRAM DETECTED	page 54

Table 2: Message List

Symptom	Troubleshooting Procedure
ERROR: NVRAM FAILURE	page 54
ERROR: PROGRAM NEEDS MORE DRAM	page 54
ERROR: PROGRAM NEEDS MORE FLASH	page 54
ERROR: PROGRAM NOT COMPATIBLE	page 54
ERROR: PROGRAM NOT VALID	page 55
ERROR: SECURITY PAL NOT DETECTED	page 55
ERROR: SHORT AT ADDRESS XXXX	page 55
ERROR: WRITING TO FLASH	page 55
ERROR: WRONG CHECKSUM	page 55
EXHAUST FAN FLT	page 56
FIRMWARE ERROR	page 56
FM HEADER ERROR	page 57
FRAMING ERROR	page 57
GRF CHK ERROR PRESS STOP	page 57
HAM. COIL OPEN*	page 57
HAMMER COIL BAD #, #, #, #, ... etc.	page 58
HB NOT INSTALLD*	page 58
HMR BANK FAN FLT	page 58
ILL EXT BUS ACC*	page 59
ILL INST ACCSS*	page 60
ILLGL OPR ACCSS*	page 60
INTAKE FAN FAULT	page 60
INVALID ACTIVATE	page 60
INVALID COMMAND	page 61

Table 2: Message List

Symptom	Troubleshooting Procedure
LO DRV. SHORT*	page 61
LOAD PAPER	page 62
LOADING PROGRAM FROM PORT XX%	page 62
ONLINE 28 CU NOT ENAB	page 63
ONLINE 8344 FAILED	page 63
ONLINE CU TIMED OUT	page 63
PAP BAD TABLE*	page 63
PAP BSY TOO LNG*	page 64
PAP FIFO OVERFL*	page 64
PAP FIFO UNDRFL*	page 64
PAP ILLGL ST*	page 65
PAP INCMPL ENER*	page 65
PAP INVLD CMD*	page 65
PAP INVLD PARM*	page 65
PAP NOT SCHED*	page 66
PAP NT AT SPEED*	page 66
PAP UNEXP INT*	page 66
PARAMETER ERROR	page 66
PARITY ERROR	page 67
PLAT INV CMD*	page 67
PLAT INV PARM*	page 67
PLAT INV STATE*	page 67
PLEASE WAIT... RESET IN PROGRESS	page 68
POWER SAVER MODE	page 69
POWER SUPPLY HOT	page 69
PRINTER HOT	page 72
PROTECTED INSTR*	page 73

Table 2: Message List

Symptom	Troubleshooting Procedure
PWR SUPP VOLT*	page 73
QUEUE OVERRUN	page 73
RESTORING BOOT CODE	page 73
RIB INVLD CMD*	page 75
RIB INVLD STATE*	page 75
RIBBON DRIVE	page 75
RIBBON INK OUT CHANGE RIBBON	page 76
SCS COMMAND ERROR	page 76
SECURITY CODE VIOLATION	page 77
SECURITY PAL NOT DETECTED	page 76
SENDING PROGRAM TO EC PROCESSOR	page 77
SF ERROR	page 77
SHUTL INV CMD*	page 78
SHUTL INV PARM*	page 78
SHUTTLE JAM	page 79
SOFTWARE ERROR* CYCLE POWER	page 80
STACK OVERFLOW*	page 80
STACK UNDERFLOW*	page 80
STACKER FAULT	page 82
STACKER FULL	page 83
STACKER JAM	page 83
TABLE MISMATCH DOWNLOAD AGAIN	page 85
TCB CORRUPTED*	page 85
UNDEF INTERRUPT*	page 86
UNDFNED OPCODE*	page 86
UP DRV. SHORT*	page 86

Troubleshooting Other Symptoms

WARNING **Always disconnect the AC power cord from the printer before doing a maintenance procedure. Failure to remove power could result in injury to you or damage to equipment. If you must apply power during maintenance, you will be instructed to do so in the maintenance procedure.**

Use standard fault isolation techniques to troubleshoot malfunctions not indicated by display messages. These techniques are summarized below:

1. Ask the operator to describe the problem.
2. Verify the fault by running a diagnostic printer test or by replicating conditions reported by the user.
3. Look for a match in the **General Symptom List** below. If you find a match, go to the troubleshooting procedure and follow the numbered instructions.
4. If you cannot find the symptom in the **General Symptom List**, use the Half-Split Method to find the malfunction:
   a. Start at a general level and work down to details.
   b. Isolate faults to half the remaining system at a time, until the final half is a field-replaceable part or assembly. (Troubleshooting aids are listed on page 29.)
5. Replace the defective part or assembly. Do not attempt field repairs of electronic components or assemblies. Most electronic problems are corrected by replacing the printed circuit board assembly, sensor, or cable that causes the fault indication. The same is true of failures traced to the hammer bank: replace the entire shuttle frame assembly. It is not field repairable.
6. Test printer operation after every corrective action.
7. Reinstall any parts you replaced earlier that did not solve the problem.
8. Stop troubleshooting and return the printer to normal operation when the reported symptoms disappear.

Table 3: General Symptom List

Symptom	Troubleshooting Procedure
Communications Failures	page 88
Jams	
CLEAR PAPER JAM message instead of LOAD PAPER when printer is out of paper	page 47
CLEAR PAPER JAM message will not clear and paper does not move	page 47
CLEAR PAPER JAM message will not clear but paper moves	page 48

Table 3: General Symptom List

Symptom	Troubleshooting Procedure
Control Panel	
Black squares on control panel	page 44
Control panel blank	page 50
Control panel keys do not work	page 51
Control panel display shows garbled, broken characters	page 51
Power Failures	
No power, and control panel blank, and card cage fan not running	page 62
Printer does not initialize	page 71
Power Stacker	
Printer does not detect presence of power stacker	page 70
Stacker “chatters” at upper or lower limit	page 80
Stacker does not stack properly	page 81
Stacker elevator does not move	page 81
Stacker elevator moves by itself	page 82
Stacker limit switch check	page 83
Stacker motor check	page 84
Stacker not operating	page 70
Print Quality	
Characters or dots are missing, smeared, too light, or too dark	page 45
Horizontal misalignment of characters (Dots or characters move left or right from dot row to dot row or line to line)	page 59
Randomly misplaced dots	page 74
Vertical misalignment of characters: 1. Dots or characters move up or down from dot row to dot row or line to line 2. Incorrect spacing from dot row to dot row or line to line 3. Characters randomly compressed and/or enlarged	page 86
Printer Operation	
Downloads consistently fail	page 52
Flash SIMM won’t copy	page 57
Paper feeds poorly	page 68

Table 3: General Symptom List

Symptom	Troubleshooting Procedure
Power on “hang” condition	page 69
Printer does not print from the host	page 71
Printer does not print self tests	page 72
Reverse paper feed: platen does not open	page 73
TOF is lost repeatedly	page 85
Ribbon	
Ribbon folding or feed problems	page 75
Shuttle	
Shuttle does not move	page 77
Shuttle is noisy	page 78

Troubleshooting Procedures

Troubleshooting procedures are listed in this section. Every troubleshooting procedure has three parts:

MESSAGE / MALFUNCTION — The LCD message or a description of the malfunction

1. TEST / INSPECTION / EXPLANATION — Numbered steps that provide information and tell you what to test or inspect

   CORRECTIVE ACTION — Actions to take as a result of tests or inspections

How to Use the Troubleshooting Procedures

1. Find the message or symptom you want to troubleshoot in the **Message List** (page 31) or the **General Symptom List** (page 36). The lists tell you which page the troubleshooting procedure is on. Go to that page.
2. Start at step 1 of the troubleshooting procedure. Each step has corrective action(s) indented below it.
3. Test the printer after every step and corrective action.
4. Work sequentially down the steps until the problem is solved. STOP troubleshooting as soon as the problem is solved.
5. Reinstall any original parts you replaced earlier that did NOT solve the problem.
6. Reassemble the printer and give it a final test.

The Procedures

06 HOST REQUEST Message

1. Status message: in CT emulation, the host computer or printer controller requires attention.

   Not a printer problem.

08 HOLD PRINT TIMEOUT Message

1. Status message: in CT emulation, the printer was off-line more than 10 minutes and the “Intervention Required” parameter is set to “Send to Host.”

   Press **ON LINE.**

8.5V PWR FAIL* Message

1. 8.5 Volt Power Failed. Internal power failure.

   Cycle power. If the message appears, replace the power supply board.

2. Power on the printer.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

3. Power on the printer.

   If the message appears, replace the shuttle frame assembly.

15 COMM CHECK Message

1. Communication Check: a message that appears in the CT emulation meaning the line is not active on a twinax interface. Power off the printer. Check the twinax host data cable connection and twinax I/O cable connection at the CT board.

   Reseat the twinax host data cable connection and the twinax I/O cable connection at the CT board.

2. Disconnect the twinax auto-termination cable from the printer. Test the cable for the resistances shown in the Main Wire Harness Test Tables in Appendix A.

   If resistances are not correct, replace the twinax auto-termination cable.

3. Power on the printer. Send a print job to the printer. Verify that all other devices on the twinax line are working properly. (Refer to line problem determination procedures, as recommended by the host system.)

   If the message is gone, the host has reestablished communication with the printer. If all other twinax devices work properly and the

message still appears, replace the expansion-CT board. Record the message and return it with defective board.

15V CTL FAIL* Message

1. Controller Voltage Failure.

   Cycle Power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the flash memory.

3. Power on the printer. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board. Also check the resistance of connectors P106/LRIB M and P107/RRIB M. (Refer to the Main Wire Harness Test Tables in Appendix A.) If ribbon motor resistance is not correct, replace the motor and/or the intermediate cable, if installed.

4. Power on the printer. Run the print job again.

   If the message appears, replace the power supply board.

5. Power on the printer.

   If the message appears, replace the shuttle frame assembly.

22 INVALID ADDR Message

1. Invalid Address: poll time-out on the twinax interface indicating the unit address is not recognized by printer.

   Have the system administrator make sure the printer address is correct.

23.5V CTL FAIL* Message

1. 23.5 Volt Controller Failed: a voltage failure on the CMX controller board.

   Cycle Power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the flash memory.

3. Power on the printer. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

4. Power on the printer. Run the print job again.

   If the message appears, replace the power supply board.

5. Power on the printer.

   If the message appears, replace the shuttle frame assembly.

31 PAPER OUT

TIMEOUT Message

1. In the CT emulation with a coax interface, a time-out message is sent to the host if paper is not loaded within 10 minutes after **CLEAR** was pressed to clear a paper out fault. Load paper. Run a print test.

   If the message appears, replace the paper detector switch assembly.

2. Run a print test.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

32 PAPER JAM

TIMEOUT Message

1. In the CT emulation with a coax interface, a time-out message is sent to the host if paper motion has not occurred for 10 minutes after **CLEAR** was pressed to clear a paper jam fault.

   Clear the paper jam. Press **CLEAR**.

2. Press **PAPER ADVANCE** several times and check that forms feed without erratic motion, noise, or pin-hole damage.

   If forms do not feed, go to **Paper feeds poorly**, page 68.
   If forms feed, go to step 3.

3. Press **VIEW** once and check that forms move up.

   Make sure the forms thickness lever is not set too tightly.

4. Press **VIEW** again and check that the forms thickness lever rotates and the paper moves down.

   If the forms thickness lever does not rotate and/or the paper does not move down, refer to **Reverse paper feed: platen does not open**, page 73.

5. Check the paper tension between the tractors.

   Adjust the right tractor so that it does not pull paper too tightly or leave it too loose. The right tractor should hold the paper under “slight” tension.

6. Inspect the ribbon mask for bends or deformation that block the paper path or prevent paper from exiting the pedestal top cover.

   Replace a damaged hammer bank cover assembly.

7. Check the condition and tension of the platen open belt.

   Adjust the platen open belt. Replace the belt if it is damaged.

8. Check the platen open pulley and the platen pulley for looseness.

   Bottom out the platen open motor pulley on the motor shaft and torque the 1/16 inch set screw to 9 ± 2 inch-pounds (1.02 ± 0.23 N•m). Tighten the 7/64 inch setscrew in the platen shaft pulley, then open and close the forms thickness lever and check that the platen pulley setscrew does not hit the left ribbon guide.

9. Inspect the tractors and tractor door springs for damage or excessive wear.

   If either tractor is worn or damaged, replace both tractor assemblies.

10. Check the condition and tension of the paper feed belt.

    Adjust the paper feed belt. Replace the belt if it is damaged.

11. Check the platen gap.

    Adjust the platen gap.

12. Clean the paper motion detector with a cotton swab and alcohol. At the control panel, set the paper motion detector (PMD) fault setting to DISABLE. Load paper. Run a print test and observe how the paper feeds.

    If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board. If the message does not appear, replace the paper detector switch assembly and set the paper motion detector (PMD) to ENABLE.

33 PLATEN OPEN

TIMEOUT Message

1. In the CT emulation with a coax interface, the forms thickness lever has been open for at least one minute. Load paper.

   Close the forms thickness lever. Press **CLEAR.**

2. Run a print test. If a platen open or close platen message appears, power off the printer. Remove the paper path or pedestal top cover. Disconnect connector P107 from the CMX controller board. Check continuity of the platen interlock switch cable from P107 to the switch.

   Replace the platen interlock switch assembly if it fails continuity test.

3. Run a print test.

   If a platen open or close platen message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

34 RIBBON STALL

TIMEOUT Message

1. In the CT emulation with a coax interface, the ribbon has not moved for 10 minutes after **CLEAR** was pressed to clear the ribbon drive fault. Check the forms thickness lever: if it is set too tightly it can inhibit ribbon movement.

   Set the forms thickness lever to match the thickness of the paper being used, but not too tightly.

2. Inspect the ribbon guides for ink buildup, which can inhibit ribbon movement.

   Clean the printer.

3. Inspect the hammer bank cover/ribbon mask for bending or damage, which can inhibit ribbon movement.

Replace the hammer bank cover assembly if it is bent or damaged.

4. Check the platen gap. If the gap is too small, it can inhibit ribbon movement.

   Adjust the platen gap.

5. Power off the printer. Remove the paper path or pedestal top cover. Disconnect P106 and P107 from the CMX controller board. Check the resistance of LRIB M in P106 and RRIB M in P107. (Refer to the Main Wire Harness Test Tables in Appendix A.)

   If ribbon motor resistance is not correct, replace the motor. If the resistance is correct, disconnect the ribbon motor cables from the motors and check continuity. Replace a cable if it fails the continuity test.

6. Power on the printer. Run a diagnostic print test.

   If the RIBBON STALL message appears, replace the CMX controller board. Record the message and return it with the defective board.

48V PWR FAIL* Message

1. 48 Volt Power Failed: an internal power failure. Power off the printer. Remove the paper path or pedestal top cover. Check that power supply connector P101 is fully seated in connector J101 on the CMX controller board.

   Connect power supply connector P101 to J101 on the CMX controller board.

2. If the printer has the expansion-CT board, check the adapter connection to the CMX controller board.

   Make sure the 60-pin expansion adapter is correctly seated in the CMX controller board and the CT board.

3. Power on the printer.

   If the message appears, replace the hammer bank logic cable assembly (P108) and the power cable assembly (P105). (Refer to Appendix A.)

4. Power on the printer.

NOTE: If the message appears, replace the power supply board.

5. Power on the printer.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

6. Power on the printer.

   If the message appears, replace shuttle frame assembly.

ACCESS NULL PTR* Message

1. Access Null Pointer. The processor tried to access a pointer that contains nothing (null).

Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

ACTIVATE LOST Message

1. The printer detects a twinax protocol communication error and reports the error. Power off the printer. Disconnect the AC power cord from the printer. Check the twinax host data cable and twinax I/O cable connection at the expansion-CT board.

   Reseat the twinax host data cable connection and the twinax I/O cable connection at the expansion-CT board.

2. Disconnect the twinax auto-termination cable from the printer. Test the cable for the resistances shown in the Main Wire Harness Test Tables in Appendix A.

   If resistances are not correct, replace the twinax auto-termination cable.

3. Connect the power cord to the printer. Power on the printer. Send a print job to the printer.

   If the message appears, replace the twinax cable.

4. Send a print job to the printer.

   If the message appears, go to **Communications Failures**, page 88.

A TO D OVERRUN* Message

1. Analog to Digital Overrun. The analog-to-digital converter overflowed.

   Cycle power. Run the print job again. If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

Black squares on control panel display

1. Power off the printer. Remove the paper path or pedestal top cover. Disconnect the control panel cable from the panel and from J110 on the CMX controller board. Check continuity of the cable. (See Appendix A.)

   Replace the control panel cable if it fails continuity test. Connect the cable. Power on the printer. If the symptom appears, replace the control panel.

2. If the printer has the expansion-CT board, check the adapter connection to the CMX controller board.

   Make sure the 60-pin expansion adapter is correctly seated in the CMX controller board connector J111 and the expansion-CT board.

3. Power off the printer. Make sure the flash memory is seated properly in J10 and J11 on the CMX controller board. Regardless of memory configuration, J11 must be used.

Reseat flash memory.

4. Power on the printer.

   If black squares appear on the LCD, the flash memory could be blank. Replace the flash SIMM in J11 with a new flash SIMM with the boot program installed.

5. Power on the printer.

   If black squares appear on the LCD, replace the CMX controller board. Record the message and return it with defective CMX board. If the LCD displays characters correctly, download the emulation software again (page 130).

BUFFER OVERRUN Message

1. The print buffer has overflowed on a serial interface. The printed output may contain random * (asterisk) characters. Make a configuration printout. Verify that the printer matches the host serial interface configuration settings for Data Protocol, Baud Rate, Data Bits, Stop Bits, Parity, Data Terminal Ready, and Request to Send.

   Set printer serial interface parameters to match those of the host.

2. Send a print job to the printer.

   If the message appears, go to **Communications Failures**, page 88.

Characters or dots are missing, smeared, too light, or too dark

1. Check the forms thickness lever: if it is set too loose or too tightly print quality can be affected.

   Set the forms thickness lever to match the thickness of the paper being used.

2. Check the paper tension between the tractors.

   Adjust the right tractor so that it does not pull paper too tightly or leave it too loose. The right tractor should hold the paper under “slight” tension.

3. Inspect the shuttle frame assembly for print chaff, debris, or ink residue that could be causing the problem.

   Clean the shuttle frame assembly.

4. Check the ribbon for folds or tears. Check that the ribbon guides are tight and the ribbon tracks straight across them.

   Rewind or install new ribbon. If the ribbon does not track straight across the ribbon guides, adjust the ribbon guides. If the ribbon guides are loose, tighten them. If the ribbon guides are damaged, replace them.

5. Power off the printer. Remove the shuttle cover. Remove the shuttle frame assembly. Inspect the ribbon mask for bends or deformation that adversely affect paper feeding. Make sure the hammer bank cover assembly is correctly installed on its mounting pegs. Check the shuttle

frame assembly for broken hammer springs, hammer tips, or contaminations.

Replace any damaged hammer spring assemblies. Replace the hammer bank cover assembly if it is deformed or damaged.

6. Check the platen gap.

   Adjust the platen gap.

7. Remove the paper guide assembly or pedestal top cover. Make sure Connectors P105 and P108 have good connections on the CMX controller board. Make sure connectors P04 and P05 have good connections at the shuttle frame assembly.

   Reseat connectors P04, P05, P105, and P108.

8. Power on the printer.

   If the problem still occurs, replace the shuttle frame assembly.

9. Power on the printer.

   If the problem still occurs, replace the power supply board.

10. Power on the printer.

    If the problem still occurs, replace the CMX controller board.

CLEAR PAPER JAM Message

1. Inspect the paper path for jams.

   Clear jams. Load paper.

2. Press **PAPER ADVANCE** several times and check that forms feed without erratic motion, noise, or pin-hole damage.

   If forms do not feed, go to **Paper feeds poorly**, page 68.
   If forms feed, go to step 3.

3. Press **VIEW** once and check that forms move up.

   Make sure the forms thickness lever is not set too tightly.

4. Press **VIEW** again and check that the forms thickness lever rotates and the paper moves down.

   If the forms thickness lever does not rotate and/or the paper does not move down, refer to **Reverse paper feed: platen does not open**, page 73.

5. Check the paper tension between the tractors.

   Adjust the right tractor so that it does not pull paper too tightly or leave it too loose. The right tractor should hold the paper under “slight” tension.

6. Inspect the ribbon mask for bends or deformation that block the paper path or prevent paper from exiting the pedestal top cover.

   Replace a damaged hammer bank cover assembly.

7. Check the condition and tension of the platen open belt.

   Adjust the platen open belt. Replace the belt if it is damaged.

8. Check the platen open pulley and the platen pulley for looseness.

   Bottom out the platen open motor pulley on the motor shaft and torque the 1/16 inch set screw to 9 ± 2 inch-pounds (1.02 ± 0.23 N•m). Tighten the 7/64 inch setscrew in the platen shaft pulley, then open and close the forms thickness lever and check that the platen pulley setscrew does not hit the left ribbon guide.

9. Inspect the tractors and tractor door springs for damage or excessive wear.

   If either tractor is worn or damaged, replace both tractor assemblies.

10. Check the condition and tension of the paper feed belt.

    Adjust the paper feed belt. Replace the belt if it is damaged.

11. Check the platen gap.

    Adjust the platen gap.

12. Clean the paper motion detector with a cotton swab and alcohol. At the control panel, set the paper motion detector (PMD) fault setting to DISABLE. Load paper. Run a print test and observe how the paper feeds.

    If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board. If the message does not appear, replace the paper detector switch assembly and set the paper motion detector (PMD) to ENABLE.

CLEAR PAPER JAM message instead of LOAD PAPER when printer is out of paper

1. Power off the printer. Remove the paper path or pedestal top cover. Remove the barrier shield (cabinet model) or the barrier shield and paper guide (pedestal model). Check that the paper detector switch assembly is securely mounted in its bracket.

   Install the paper detector switch assembly.

2. Check that connector P106/PMD is fully seated in connector J106 on the CMX controller board.

   Connect P106/PMD to J106 on the CMX controller board.

3. Load paper. Power on the printer.

   Replace the paper detector switch assembly if either message appears.

4. Load paper. Power on the printer.

   Replace the CMX controller board if either message appears. Record the message and return it with defective CMX board.

CLEAR PAPER JAM message will not clear and paper does not move

1. Remove the paper path or pedestal top cover. Make sure connector P107/PAPR M is fully seated in connector J107 on the CMX controller board.

Connect P107/PAPR M to J107 on the CMX controller board.

2. Check the paper feed motor pulley for looseness.

   Hold the collar snug against the motor pulley and torque the 7/64 inch setscrew to 25 ± 2 inch-pounds (2.82 ± 0.23 N•m).

3. Check the condition and tension of the paper feed timing belt.

   Adjust the paper feed timing belt. Replace the belt if it is damaged.

4. Load paper. Power on the printer. Press **PAPER ADVANCE** and **VIEW** several times and check that paper moves correctly in both directions.

   Replace the paper feed motor if the message appears or the paper moves erratically.

5. Power on the printer. Press **PAPER ADVANCE** and **VIEW** several times and check that paper moves correctly in both directions.

   Replace the CMX controller board if the message appears or the paper moves erratically. Record the message and return it with defective CMX board.

CLEAR PAPER JAM message will not clear but paper moves

1. Power off the printer. Remove the paper path or pedestal top cover. Check that connector P106/PMD is fully seated in connector J106 on the CMX controller board.

   Connect P106/PMD to J106 on the CMX controller board.

2. Remove the barrier shield (cabinet model) or the barrier shield and paper guide (pedestal model). Check that the paper detector switch assembly is securely mounted in its bracket.

   Install the paper detector switch assembly.

3. Check that the paper detector switch assembly is securely mounted to the mechanism base.

   Tighten the two screws securing the paper detector switch assembly to the mechanism base.

4. Check that the motion detector wheel rotates.

   Replace the paper detector switch assembly if the wheel does not rotate.

5. Load paper. Power on the printer.

   Replace the paper detector switch assembly if the message appears.

6. Load paper. Power on the printer.

   Replace the CMX controller board if the message appears. Record the message and return it with defective CMX board.

CLEARING PROGRAM FROM FLASH Message

1. Status message: emulation software successfully loaded into printer RAM and the checksum matched. The old program is now being deleted from flash memory.

   No action required.

CLOSE PLATEN Message

1. The forms thickness lever is open.

   Load paper. Close the forms thickness lever.

2. Power off the printer. Remove the paper path or pedestal top cover. Disconnect connector P107 from the CMX controller board. Check continuity of the platen interlock switch from P107/PLO to the switch.

   Replace the platen interlock switch assembly if it fails the continuity test. (Refer to Appendix A, Switch Assembly, Platen Interlock.)

3. Check that the platen interlock switch is not loose.

   Tighten the screws securing the platen interlock switch

4. Check the condition and tension of the platen open belt.

   Adjust the platen open belt. Replace the belt if it is damaged.

5. Check the platen open pulley and the platen pulley for looseness.

   Bottom out the platen open motor pulley on the motor shaft and torque the 1/16 inch set screw to 9 $\pm$ 2 inch-pounds (1.02 $\pm$ 0.23 N•m). Tighten the 7/64 inch setscrew in the platen shaft pulley, then open and close the forms thickness lever and check that the platen pulley setscrew does not hit the left ribbon guide.

6. Disconnect connector P106 from the CMX controller board. Check the resistance of connector P106/PLAT M. (Refer to the Main Wire Harness Test Tables in Appendix A.)

   Replace the platen open motor if it fails the resistance test.

7. Run a print test.

   If the message appears, replace the CMX controller board. Record the message and return it with the defective board.

COIL HOT Message

NOTE: The printer has sensor circuits that sample the operating temperature of key components of the print mechanism. When higher than normal temperatures are sensed, print speed is automatically reduced by 50% and a COIL HOT message is sent to the LCD to inform the operator. When the coil(s) cool down, print speed automatically returns to 100% and the message clears from the LCD. This message is normal for extremely dense print jobs, such as “All Black” plot. If the printer often prints at half speed, it may be operating in a severe environment. A severe environment is one with an ambient

temperature at or above 40° Celsius (104° Fahrenheit) or that is dirty enough to create blockage of the cabinet fan vents. The printer must never be run at ambient temperatures greater than 40° Celsius (104° Fahrenheit). If the printer is located in such an environment, relocate it to a cooler, cleaner area.

1. One or more hammer coils are overheating. Inspect printer environment for severity. (See NOTE above.)

   Advise the user to move the printer to cooler, cleaner location.

2. Check the kinds of print jobs the user is running: look for very dense graphics and layouts.

   Advise the user to run jobs in smaller batches.

3. Power off the printer. Remove the paper path or pedestal top cover. Check all fan cable connections.

   Connect fan cables.

4. Power on the printer. Verify that all fans operate.

   Replace any fan that does not operate.

5. Inspect vents and fan airways for obstructions. Look underneath cabinet models for items blocking the cabinet exhaust vents.

   Remove any obstructions from vents and airways.

6. Install the paper path or pedestal top cover. Load paper. Run the “All E’s” print test for 5 to 10 minutes.

   If the message appears, replace the shuttle frame assembly.

7. Run the “All E’s” print test for 5 to 10 minutes.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

Control panel blank

1. Power off the printer. Remove the paper path or pedestal top cover. Check all cable connections into the CMX controller board; make sure the control panel cable is seated in connector J110 on the controller board.

   Connect all cables.

2. If the printer has the expansion-CT board, check the CT cable connections and the adapter connection to the CMX controller board.

   Connect all cables. Make sure the 60-pin expansion adapter is correctly seated in the CMX controller board and the CT board.

3. Power on the printer. Inspect the control panel display and cooling fans.

   If the control panel is blank and the cooling fans come on, replace the control panel cable assembly and/or the control panel, as required.

4. Power on the printer.

   If the control panel is blank and the fans do not come on, replace the CMX controller board.

Control panel keys do not work

1. Power on the printer. Check the operation of the control panel keys.

   Replace the control panel assembly.

2. Power on the printer. Check the operation of the control panel keys.

   Replace the control panel cable assembly.

3. Power on the printer. Check the operation of the control panel keys.

   Replace the CMX controller board.

Control panel display shows garbled, broken characters

1. Remove the paper path or pedestal top cover. Check cable connections into the CMX controller board. Make sure the control panel cable is seated in connector J110 on the controller board.

   Connect all cables.

2. Make sure the DRAM SIMM(s) is/are seated properly in J15/J16.

   Reseat DRAM SIMM(s).

3. Power on the printer. Inspect the control panel display.

   If the control panel shows broken characters, replace the DRAM.

CTL VOLT FAIL* Message

1. Controller Voltage Failure. 15 V failure on the CMX controller board.

   Cycle Power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the flash memory.

3. Power on the printer. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

4. Power on the printer. Run the print job again.

   If the message appears, replace the power supply board.

5. Power on the printer.

   If the message appears, replace the shuttle frame assembly.

DIAGNOSTIC

PASSED Message

1. Status message: the printer passed its memory and hardware initialization tests.

   No action required.

Downloads consistently fail

NOTE: Most download problems are detected by software during the procedure and communicated by LCD messages. (See Table 5: on page 132.) If downloads fail consistently with no messages or with erratic messages, suspect a hardware failure.

1. Power off the printer. Remove the paper path or pedestal top cover. Check the I/O cable connections from the host to the printer. Check the parallel cable connection at J112 on the CMX controller board. Inspect all cables for damaged, bent, broken, or burnt pins.

   Replace any damaged cables. Reconnect all I/O cables; make sure all connections are clean and tight.

2. Remove the flash SIMMs. Inspect the flash SIMM sockets on the CMX controller board.

   If any socket pins are bent or damaged, replace the CMX controller board.

3. Check that customer has the right size SIMMs for the emulation. (See page 171)

   Install SIMMs that support the emulation software.

4. Power up the printer. Download the emulation (page 130).

   If the download fails, activate the Boot Diagnostics Menu (page 92) and run MISC UTILITIES / RUN MEMORY TESTS. If memory fails test, replace the DRAM. If memory tests OK, replace the flash SIMM(s).

5. Power up the printer. Download the emulation (page 130).

   If the download fails, replace the CMX controller board.

DRVR CIR BAD* Message

1. Driver Circuit Bad: the hammer coil count test failed.

   Cycle power. If the message appears, press **CLEAR.**

2. Power off the printer. Remove the shuttle cover. At the shuttle frame assembly, disconnect the hammer bank logic and power cables. Power on the printer.

   If “HB NOT INSTALLD” appears on the LCD, replace the shuttle frame assembly. If “HB NOT INSTALLD” does not appear on the LCD, replace the CMX controller board.

ERROR: DC PROGRAM NOT VALID Message

1. The printer cannot find the data controller program or the validation checksum is corrupt.

   Download the program again (page 130). If the message appears, replace all flash memory SIMMs.

ERROR: DRAM AT ADDRESS XXXXXXXX Message

1. The printer found a defective memory location.

   Replace the DRAM.

2. Power on the printer.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

ERROR: EC PROGRAM NOT VALID Message

1. The printer cannot find the engine controller program or the validation checksum is corrupt.

   Download the program again (page 130). If the message occurs again, replace all flash memory SIMMs.

2. Power on the printer. Download the emulation.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

ERROR: EC STOPPED AT STATE XXXX Message

NOTE: If the EC stops at state 0000 at power-up, replace the CMX controller board. Record the message and return it with the defective board.

1. Where XXXX is a number from 0000 to 0010. The Engine Controller has stopped and is in the state identified by the number displayed. Power off the printer. Remove all flash memory and DRAM SIMMs. Inspect the SIMM sockets on the CMX controller board.

   If any socket pins are bent or damaged, replace the CMX controller board.

2. Install the flash and DRAM SIMMs, making sure they are fully and correctly seated. Power on the printer. Download the emulation (page 130).

   If the message appears, replace the flash SIMM(s).

3. Power on the printer. Download the emulation.

   If the message appears, replace the DRAM SIMM(s).

4. Power on the printer. Download the emulation.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

ERROR: FLASH DID NOT PROGRAM Message

1. The printer encountered an error trying to program flash memory.

Download the program again (page 130). If the message occurs again, replace the flash memory.

ERROR: FLASH NOT DETECTED Message

1. The printer could not find flash memory.

   Check flash memory on the CMX controller board. If present, reseat the flash SIMMs; if missing, install flash SIMMs.

ERROR: NO DRAM DETECTED Message

1. The printer could not find any DRAM.

   Check DRAM on the CMX controller board. If present, reseat DRAM; if missing, install DRAM.

ERROR: NVRAM FAILURE Message

1. The non-volatile memory has failed.

   Replace the CMX controller board. (Do NOT attempt to replace NVRAM.) Record the message and return it with defective CMX board.

ERROR: PROGRAM NEEDS MORE DRAM Message

1. The printer requires more DRAM memory in order to run the downloaded program.

   Add DRAM or use a smaller emulation program.

ERROR: PROGRAM NEEDS MORE FLASH Message

1. The printer requires more flash memory in order to run the downloaded program.

   Add flash memory or use a smaller emulation program.

ERROR: PROGRAM NOT COMPATIBLE Message

1. The printer is not compatible with the downloaded program.

   Use the correct emulation software option(s) for this model printer.

ERROR: PROGRAM NOT VALID Message

1. The printer does not see a program in flash memory.

   There is no program in printer memory. Download the emulation (page 130).

ERROR: SECURITY PAL NOT DETECTED Message

1. The security PAL is not present or has failed.

   Check the security PAL at location U54 on the CMX controller board. If the PAL is absent, install the correct PAL. If a security PAL is present, replace it.

2. Power on the printer.

   If the message appears, replace the replace the CMX controller board. Record the message and return it with the defective board.

ERROR: SHORT AT ADDRESS XXXX Message

1. Hardware failure in DRAM or CMX controller circuitry.

   Download the program again (page 130). If the message occurs again, replace the DRAM. If message occurs with new memory, replace the CMX controller board. Record the message and return it with defective CMX board.

ERROR: WRITING TO FLASH Message

1. Hardware or software fault in flash memory.

   Replace flash memory. If message occurs with new memory, replace the CMX controller board. Record the message and return it with defective CMX board.

ERROR: WRONG CHECKSUM Message

1. The printer received the complete program but the checksum did not match. The data may have been corrupted during download.

   Power off the printer. Download the program again from the beginning (page 130). If the messages appears, replace the DRAM.

2. Download the program using a new software diskette.

   If the messages appears, replace the flash memory.

3. Download the program.

If the messages appears, replace the CMX controller board. Record the message and return it with defective CMX board.

EXHAUST FAN FLT Message

1. Exhaust Fan Fault. Sensors cannot detect current in the fan circuit.

   Cycle power. If the message appears, press **CLEAR.**

2. Check that the exhaust fan is connected to exhaust fan cable connector J307.

   Connect the fan cable connector.

3. Power off the printer. Remove the paper path. Disconnect connector P107 from the CMX controller board. Test connector P107/EHF for shorts or opens. (Refer to the Main Wire Harness Test Tables in Appendix A.)

   Replace components that fail test.

4. Make sure connector P107/EHF has a good connection at J107 on the CMX controller board.

   Connect P107 to the CMX controller board.

5. Inspect for obstructions of airways and vents. Check for items beneath the printer blocking cabinet vents.

   Remove obstructions. Make sure cabinet exhaust fan vents are not blocked.

6. Power on the printer. Check for fan operation.

   If the message appears or the fan doesn't work, replace the exhaust fan.

7. Power on the printer.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

FIRMWARE ERROR Message

1. Application software tried to perform an illegal printer function or damaged memory is detected on the CMX controller board. (If the message appears at power-up, replace the CMX controller board. Record the message and return it with defective CMX board.)

   Cycle power. Run the print job. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the flash memory.

3. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

4. Power on the printer. Run the print job again.

   If the message still appears, there is an application software error. Use your local support procedure to request assistance.

Flash SIMM won't copy

1. Power off the printer. Remove the flash SIMMs. Inspect the flash SIMM sockets on the CMX controller board.

   If any SIMM socket pins are bent or damaged, replace the CMX controller board.

2. Make sure the blank SIMM is the same size as the SIMM to be copied. Install the SIMMs, making sure they are fully and correctly seated. Power on the printer. From the Boot Diagnostics menu, select and run MISC UTILITIES / COPY FLASH SIMMS. (See page 92.)

   If the DESTINATION NOT DETECTED message appears, the blank SIMM is not a type supported by the boot code on the original SIMM. If SOURCE LARGER THAN DESTINATION appears, the blank SIMM is not large enough to contain the code on the original SIMM. If the SIMM does not copy or the ERROR WRITING TO FLASH message appears, replace the blank SIMM.

3. Power on the printer. From the Boot Diagnostics menu, select and run MISC UTILITIES / COPY FLASH SIMMS.

   If the new SIMM does not copy, replace the CMX controller board.

FM HEADER ERROR Message

1. Frame Header Error. Application software has violated header parameters.

   Not a printer problem. The system administrator should correct applications data or configuration.

FRAMING ERROR Message

1. The printed output may contain random ! (exclamation point) characters. Make a configuration printout. Verify that the printer matches host configuration settings for Data Protocol, Baud Rate, Data Bits, Stop Bits, Parity, Data Terminal Ready, and Request to Send.

   Set printer serial interface parameters to match those of the host.

2. Send a print job to the printer.

   If the message appears, go to **Communications Failures**, page 88.

GRF CHK ERROR
PRESS STOP Message

1. Graphic Check Error: in the CT emulation over a twinax interface, the printer received a non-printable character.

   Press **CLEAR** then press **ON LINE**.

HAM. COIL OPEN* Message

1. Hammer Coil Open. Electrical malfunction of one or more hammer coils.

Cycle power. If the message appears, replace the shuttle frame assembly.

2. Power on the printer. Run a print test.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

HAMMER COIL BAD

#, #, #, #, ... etc. Message

1. Hammer coil(s) number #, #, etc. failed the current test at power-up. Check that the hammer bank cables are connected.

   Cycle power. If the message appears, replace the shuttle frame assembly. Record the message and return it with the defective assembly.

2. Power on the printer.

   If the message appears, replace CMX controller board. Record the message and return it with the defective assembly.

HB NOT INSTALLD* Message

1. Hammer Bank Not Installed. Self-test routines do not detect hammer coils at printer start-up. Power off the printer. Verify that the shuttle frame assembly is installed.

   Install the shuttle frame assembly.

2. Remove the paper path or pedestal top cover. Verify that the hammer bank logic cable is connected to connector J108 on the CMX controller board and to the shuttle frame assembly.

   Connect the hammer bank logic cable to connector J108 on the CMX controller board and to the shuttle frame assembly.

3. Power on the printer.

   If the message appears, replace the hammer bank logic cable.

4. Power on the printer.

   If the message appears, replace the shuttle frame assembly.

5. Power on the printer.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

HMR BANK FAN FLT Message

1. Hammer Bank Fan Fault. Sensors cannot detect current in the fan circuit.

   Cycle power. If the message appears, press **CLEAR**. If the message does not clear, go to step 2.

2. Power off the printer. Remove the paper path or pedestal top cover. Disconnect connector P107 from the CMX controller board. Test

connector P107/HBF for shorts or opens. (Refer to the Main Wire Harness Test Tables in Appendix A.)

Replace components that fail test.

3. Make sure P107/HBF has a good connection at J107 on the CMX controller board.

   Connect P107 to the CMX controller board.

4. Inspect for obstructions of airways and vents.

   Remove obstructions.

5. Power on the printer.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

Horizontal misalignment of characters (Dots or characters move left or right from dot row to dot row or line to line

1. If dots between alternate dot rows are misaligned, check the hammer phasing.

   Adjust hammer phasing.

2. If the printer is a P5X05 model (i.e., a 475 or 500 lpm model), check the shuttle speed setting.

   Set the shuttle speed (page 135).

3. Inspect the shuttle frame assembly area for ink residue, paper chaff, or debris.

   Clean the shuttle frame assembly.

4. Check the MPU gap.

   Using a feeler gauge, adjust the gap between the MPU assembly and the flywheel to 0.010 ± .001 inch (0.254 ± 0.025 mm). Torque the 7/16 inch MPU clamp screw to 18 ± 1 inch-pounds (2.03 ± 0.11 N•m).

5. Power up the printer. Run a print test.

   If the symptom is not gone, replace the MPU.

6. Power up the printer. Run a print test.

   If the symptom is not gone, replace the CMX controller board.

7. Power up the printer. Run a print test.

   If the symptom is not gone, replace the shuttle frame assembly.

ILL EXT BUS ACC* Message

1. Illegal External Bus Access. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

ILL INST ACCSS* Message

1. Illegal Instruction Accessed. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

ILLGL OPR ACCSS* Message

1. Illegal Operand Accessed. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

INTAKE FAN FAULT Message

1. Sensors cannot detect current in the card cage fan circuit.

   Cycle power. If the message appears, press **CLEAR**. If the message does not clear, go to step 2.

2. Power off the printer. Remove the paper path or pedestal top cover. Disconnect connector P106 from the CMX controller board. Test connector P106/CCF for shorts or opens. (Refer to the Main Wire Harness Test Tables in Appendix A.)

   Replace components that fail test.

3. Make sure P106/CCF has a good connection at J106 on the CMX controller board.

   Connect P106 to the CMX controller board.

4. Inspect for obstructions of airways and vents.

   Remove obstructions.

5. Power on the printer.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

INVALID ACTIVATE Message

1. The printer detects a twinax protocol communications error and reports the error. Power off the printer. Disconnect the AC power cord from the printer. Check the twinax host data cable and twinax I/O cable connection at the expansion-CT board.

Reseat the twinax host data cable connection and the twinax I/O cable connection at the expansion-CT board.

2. Disconnect the twinax auto-termination cable from the printer or from the last device on this twinax port. Test the cable for the resistances shown in the Main Wire Harness Test Tables in Appendix A.

   If resistances are not correct, replace the twinax auto-termination cable.

3. Connect the power cord to the printer. Power on the printer. Send a print job to the printer.

   If the message appears, replace the twinax cable.

4. Send a print job to the printer.

   If the message appears, go to **Communications Failures**, page 88.

INVALID COMMAND Message

1. The printer detects a twinax protocol communications error and reports the error. Power off the printer. Disconnect the AC power cord from the printer. Check the twinax host data cable and twinax I/O cable connection at the expansion-CT board.

   Reseat the twinax host data cable connection and the twinax I/O cable connection at the expansion-CT board.

2. Disconnect the twinax auto-termination cable from the printer. Test the cable for the resistances shown in the Main Wire Harness Test Tables in Appendix A.

   If resistances are not correct, replace the twinax auto-termination cable.

3. Connect the power cord to the printer. Power on the printer. Send a print job to the printer.

   If the message appears, replace the twinax cable.

4. Send a print job to the printer.

   If the message appears, go to **Communications Failures**, page 88.

LO DRV. SHORT* Message

1. Lower Driver Short. Circuit(s) on the hammer bank or in the hammer bank power cable are shorted to ground.

   Cycle power. If the message appears, press **CLEAR**. If message does not clear, replace the hammer bank logic cable and the hammer bank power cable.

2. Power on the printer.

   If the message appears, replace the shuttle frame assembly.

3. Power on the printer.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

LOAD PAPER Message

1. Printer is out of paper.

   Load paper. Press **CLEAR**. If message does not clear, go to step 2.

2. Power off the printer. Remove the paper path or pedestal top cover. Remove the barrier shield (cabinet model) or the barrier shield and paper guide (pedestal model). Check that the paper detector switch assembly is securely mounted in its bracket.

   Install the paper detector switch assembly.

3. Check that connector P106/PMD is fully seated in connector J106 on the CMX controller board.

   Connect P106/PMD to J106 on the CMX controller board.

4. Load paper. Power on the printer.

   Replace the paper detector switch assembly if message appears.

5. Load paper. Power on the printer.

   Replace the CMX controller board if message appears. Record the message and return it with defective CMX board.

LOADING PROGRAM FROM PORT XX% Message

1. Status message: the new emulation program is loading into printer RAM. XX% indicates how much of the program has loaded.

   No action required.

No power, and control panel blank, and card cage fan not running

1. Check that the AC power outlet has power.

   Restore AC power.

2. Unplug the printer AC power cord from the printer (leave it plugged into the power outlet) and check for AC power at the printer end of the cord.

   If there is no power through the AC power cord, replace it. Plug the AC power cord into the printer and power outlet.

3. Remove the paper path or pedestal top cover. Verify that the AC-in power cable and the AC power input cables are connected to the on/off switch-circuit breaker. (See Figure 42, page 232.)

   Connect the AC-in power supply cable and AC power input cables to the on/off switch-circuit breaker. Make sure all ground connections are clean and tight.

4. Check that AC-in power cable connector P1 is connected to J1 on the power supply board.

   Connect AC-in power cable connector P1 to J1.

5. Check that power supply cable connector P101 is connected to J101 on the CMX controller board.

   Connect power supply connector P101 to J101 on the CMX controller board.

6. Check all cable connections on the CMX controller board.

   Connect all cables.

7. If the printer has the expansion-CT board, check the CT cable connections and the adapter connection to the CMX controller board.

   Connect all cables. Make sure the 60-pin expansion adapter is correctly seated in the CMX controller board and the CT board.

8. Disconnect AC-in power supply cable connector P1. Set the circuit breaker to 1 (on). Measure AC voltage at pins 1 and 2 of connector P1.

   If no voltage, replace the circuit breaker. If there is voltage, replace the power supply board.

ONLINE

28 CU NOT ENAB Message

1. Controller Unit Not Enabled. Poll time-out error. The printer was not polled for one minute across a coax interface.

   Check cable connection and host system. (Refer to line problem determination procedures, as recommended by the host system.)

ONLINE

8344 FAILED Message

1. Link-level code test detects a hardware failure on the expansion-CT board.

   Replace the expansion-CT board. Record the message and return it with defective board.

ONLINE

CU TIMED OUT Message

1. Controller Unit Timed Out: the printer was not enabled for one minute or more on a coax interface.

   Check cable connection and host system. (Refer to line problem determination procedures, as recommended by the host system.)

PAP BAD TABLE* Message

NOTE: If this message appears during a software download, do the download again. If the message appears on the second try, replace the CMX controller board. Record the message and return it with defective CMX board.

1. Paper Bad Table. The paper feed process on the CMX controller board has a corrupted table.

   Cycle power. Run the print job again. If the message appears, download the emulation software again.

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PAP BSY TOO LNG* Message

1. Paper Busy Too Long. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Run the print job again.

   If the message appears, power off the printer. Remove the paper path or pedestal top cover. Make sure connectors P106 and P107 are fully seated on the CMX controller board. Make sure the MPU cable, the hammer bank logic cable, and the hammer bank power cable are undamaged and have good connections. Replace as necessary. (Refer to Appendix A.)

3. Power on the printer. Run the print job again.

   If the message appears, replace the shuttle frame assembly.

4. Power on the printer. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PAP FIFO OVERFL* Message

1. Paper First In First Out Overflow. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Power on the printer. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PAP FIFO UNDRFL* Message

1. Paper First In First Out Underflow.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Run the print job again.

   If the message appears, power off the printer. Remove the paper path or pedestal top cover. Make sure connectors P106 and P107 are fully seated on the CMX controller board. Make sure the MPU cable, the hammer bank logic cable, and the hammer bank power cable are

undamaged and have good connections. Replace as necessary. (Refer to Appendix A.)

3. Check hammer phasing.

   Try using a lower phasing value; sometimes this message indicates too high a hammer phase value.

4. Power on the printer. Run the print job again.

   If the message appears, replace the shuttle frame assembly.

5. Power on the printer. Run the print job again.

   If the message appears, replace the power supply board.

6. Power on the printer. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PAP ILLGL ST* Message

1. Paper Illegal State. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PAP INCMPL ENER* Message

1. Paper Incompletely Energized. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PAP INVLD CMD* Message

1. Paper Invalid Command. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PAP INVLD PARM* Message

1. Paper Invalid Parameter. Firmware error on the CMX controller board.

Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PAP NOT SCHED* Message

1. Paper Not Scheduled. The paper feed process is not scheduling on the CMX controller board, and the printer cannot feed paper.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the MPU cable assembly.

3. Power on the printer. Run the print job again.

   If the message appears, replace the power supply board.

4. Power on the printer. Run the print job again.

   If the message appears, replace the shuttle frame assembly.

5. Power on the printer. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PAP NT AT SPEED* Message

1. Paper Not At Speed. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PAP UNEXP INT* Message

1. Paper Unexpected Interrupt. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PARAMETER ERROR Message

1. Illegal parameter value received in a command code over a coax/twinax interface.

   Press **CLEAR** then press **ON LINE**.

2. Run the print job that generated the error message.

   If the message appears, check the host data for invalid characters.

3. Ask the system operator to verify that the printer's Device ID is set to the correct emulation with respect to the host configuration.

   Set printer Device ID to the correct emulation with respect to the host configuration.

4. Run the print job that generated the error message.

   If the message appears, go to **Communications Failures**, page 88.

PARITY ERROR Message

1. The printed output may contain random ? (question mark) characters. Make a configuration printout. Verify that the printer matches host serial configuration settings for Data Protocol, Baud Rate, Data Bits, Stop Bits, Parity, Data Terminal Ready, and Request to Send.

   Set printer serial interface parameters to match those of the host.

2. Send a print job to the printer.

   If the message appears, replace the serial data cable.

3. Send a print job to the printer.

   If the message appears, go to **Communications Failures**, page 88.

PLAT INV CMD* Message

1. Platen Invalid Command. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PLAT INV PARM* Message

1. Platen Invalid Parameter. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PLAT INV STATE* Message

1. Platen Invalid State. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PLEASE WAIT...

RESET IN PROGRESS Message

1. Status message: the printer finished loading the program into flash memory and is automatically resetting itself.

   No action required.

Paper feeds poorly

1. Check the forms thickness lever: if it is set too tightly paper feeding can be affected.

   Set the forms thickness lever to match the thickness of the paper being used.

2. Power off the printer. Remove paper. Inspect the paper feed path for obstructions that could snag paper.

   Clear paper feed path of any obstructions.

3. Inspect the tractors and tractor door springs for damage or excessive wear.

   If either tractor is damaged or excessively worn, replace both tractor assemblies.

4. Check the paper feed motor pulley for looseness.

   Hold the collar snug against the motor pulley and torque the 7/64 inch setscrew to 25 ± 2 inch-pounds (2.82 ± 0.23 N•m).

5. Check the condition and tension of the paper feed timing belt.

   Adjust the paper feed timing belt. Replace the belt if it is damaged.

6. Check the platen gap.

   Adjust the platen gap.

7. Remove the paper path or pedestal top cover. Make sure connector P107/PAPR M is fully seated in connector J107 on the CMX controller board.

   Connect P107/PAPR M to J107 on the CMX controller board.

8. Load paper. Power on the printer. Press **PAPER ADVANCE** and **VIEW** several times and check that paper moves in both directions.

   Replace the paper feed motor if paper does not move in both directions.

9. Power on the printer. Press **PAPER ADVANCE** and **VIEW** several times and check that paper moves in both directions.

   Replace the CMX controller board if paper does not move in both directions.

Power on “hang” condition

1. Remove the paper path or pedestal top cover. Check all cable connections to the CMX controller board and the power supply board.

   Connect cables.

2. Power up the printer.

   If the printer “hangs,” replace the CMX controller board.

3. Power up the printer.

   If the printer “hangs,” replace the power supply board.

POWER SAVER MODE Message

1. This is a status message. The printer is in low–energy idle state, all fans and higher voltages are off, only +5Vdc logic circuits are active.

   No action required, but you can press the PAPER ADVANCE key to revive the printer from power saver mode.

POWER SUPPLY HOT Message

NOTE: The printer has sensor circuits that sample the operating temperature of key components of the power supply. When higher than normal temperatures are sensed, print speed is automatically reduced. If the printer runs at reduced speed for an extended period of time, the POWER SUPPLY HOT message is sent to the LCD and printing stops, allowing printer components to cool down. Pressing the **CLEAR** key resumes the print task. Check the operating environment. A severe environment is one with an ambient temperature at or above 40° Celsius (104° Fahrenheit) or is dirty enough to create blockage of the cabinet fan vents. The printer must never be run at ambient temperatures greater than 40° Celsius (104° Fahrenheit). If the printer is located in such an environment, relocate it to a cooler, cleaner area.

1. Inspect printer environment for severity. (See NOTE above.)

   Advise the user to move the printer to cooler, cleaner location.

2. Check the kinds of print jobs the user is running: look for very dense graphics and layouts.

   Advise the user to run jobs in smaller batches.

3. Power off the printer. Remove the paper path or pedestal top cover. Check that the power supply guard/air deflector is correctly positioned over the power supply board. **WARNING: DO NOT TOUCH THE POWER SUPPLY**, but hold your hand close enough to check for heat radiating off the power supply board.

   If the power supply is noticeably hot, replace it.

4. Check that all fan cables are connected.

   Connect all fan cables.

5. Inspect vents and fan airways for obstructions. Look underneath cabinet models for items blocking the cabinet exhaust vents.

   Remove any obstructions from vents and airways.

6. Install paper path or pedestal top cover. Load paper. Power on the printer. Run the “All E’s” print test for 5-10 minutes.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

Printer does not detect presence of power stacker

—or—

Stacker not operating

1. Check that the power stacker is enabled under the Printer Control menu. (Refer to the *Setup Guide.)*

   Enable the power stacker under the Printer Control menu. If the power stacker enable/disable option does not appear in the menu, go to the next step.

2. Open the rear cabinet door. Check that the ON/OFF indicator lamp is lit.

   If the ON/OFF indicator is not lit, go to step 3.

   If the ON/OFF indicator is lit, press the ON LINE key and check that the ON LINE indicator lights. If the ON LINE indicator comes on, the stacker is detected by the printer. If the ON LINE indicator does not come on, go to step 4.

3. a) Power off the printer.
   b) Unfasten the cable clamp holding the stacker control panel cables.
   c) Disconnect the stacker power cable from the back of the stacker control panel. (See Figure 59, page 313.)
   d) Locate pin 1 of connector P106. (See the cable assembly drawing in Appendix A.)
   e) Power on the printer.
   f) At connector P106 check for +48 volts DC between pins 1 and 2 and +5 volts DC between pins 3 and 4.

   If the voltages are correct, replace the stacker control panel. If the voltages are not correct, power off the printer, remove the paper path, and disconnect the stacker power cable from the CMX controller board. (See Figure 64, page 318.) Check the continuity of the stacker power cable between P105 and P106. If the cable fails the continuity test, replace it. If the cable is OK, replace the CMX controller board.

4. Power off the printer. Remove the paper path. Disconnect stacker cables from the CMX controller board, stacker assembly, and the stacker control panel (see Figure 59, page 313). Check cables for cuts, breaks, or damaged pins. Check continuity of cables. (See Appendix A.)

   Replace any cable that is damaged or fails continuity test. Reconnect all stacker cables to the CMX controller board, stacker, and stacker control panel.

5. Power on the printer. Check that the ON LINE indicator lights on the stacker control panel.

If the ON LINE indicator does not light, replace the stacker control panel.

6. Power on the printer. Check that the ON LINE indicator lights on the stacker control panel.

   If the ON LINE indicator does not light, replace the CMX controller board.

Printer does not initialize

NOTE: Power-on initialization is explained on page 99.

1. Power off the printer. Remove the paper guide or pedestal top cover. Check that all cables are connected to the CMX controller board.

   Reseat all cable connectors on the CMX controller board, especially connectors P106 and P107.

2. If the printer has the expansion-CT board, verify that the user is running CT emulation software. If the printer does not have the expansion-CT board, go to step 6.

   Download CT emulation software.

3. If the printer has the expansion-CT board, check that the user has enough flash memory installed to handle the emulation software. (See Figure 24 on page 173, and the Boot Diagnostics Menu on page 92.)

   Install flash memory and download emulation software.

4. If the printer has the expansion-CT board, check the adapter connection to the CMX controller board.

   Connect all cables. Make sure the 60-pin expansion adapter is correctly seated in both the CMX controller board and the CT board.

5. Power up the printer.

   If the fans run but the printer does not initialize, replace the expansion-CT board.

6. Power up the printer.

   If the fans run but the printer does not initialize, replace the power supply board.

7. Power up the printer.

   If the fans run but the printer does not initialize, replace the CMX controller board.

Printer does not print from the host

1. Check the host data cable connection at the rear of the printer.

   Attach the data cable to the printer interface.

2. Make a configuration printout. Verify that the printer matches host interface settings.

   Set printer interface parameters to match those of the host.

3. Power up the printer. Send a print job from the host.

If printer does not print and the interface is RS-232, interchange the wires to pins 2 and 3. (This is the most common cause of an inoperative RS-232 cable.) Verify that the host and printer have the same baud rate, number of data bits, number of stop bits, and parity. Configure the host for XON/XOFF if possible, since this requires the least complex cable.

4. Power up the printer. Send a print job from the host.

   If the printer does not print from the host, replace the data and interface cable assemblies.

5. Remove the paper path or pedestal top cover. Check all cable connections on the CMX controller board.

   Reseat all cable connectors on the CMX controller board.

6. Power up the printer. Send a print job from the host.

   If the printer still does not print from the host, replace the CMX controller board.

Printer does not print self tests

1. Power off the printer. Remove the paper path or pedestal top cover. Disconnect the control panel cable from connector J110 on the CMX controller board. Disconnect the control panel cable from the control panel. Check continuity of the control panel cable assembly.

   Replace the control panel cable assembly if it fails continuity test.

2. Connect the control panel cable assembly to J110 on the CMX controller board and to the control panel. Load paper. Power on the printer. Run a self test.

   If the self test does not run, replace the control panel assembly.

3. Power on the printer. Run a self test.

   If the self test does not run, replace the CMX controller board.

PRINTER HOT Message

NOTE: This message indicates internal temperatures over 60° Celsius (140° Fahrenheit). Print jobs will not create such temperatures, so immediately determine that the fans are operating and that all air vents are unobstructed. It is crucial that the exhaust vents on the floor of the cabinet remain unblocked, since hot air from inside the printer is vented through the cabinet floor. Nothing must be stored under the printer. Then check the operating environment. A severe environment is one with an ambient temperature at or above 40° Celsius (104° Fahrenheit) or is dirty enough to create blockage of the cabinet fan vents. The printer must never be run at ambient temperatures greater than 40° Celsius (104° Fahrenheit). If the printer is located in such an environment, relocate it to a cooler, cleaner area.

1. CMX controller board sensors report high temperatures on the board. Inspect printer environment for severity. (See NOTE above.)

   Advise the user to move the printer to cooler, cleaner location.

2. Power off the printer. Remove the paper path or pedestal top cover. Check that all fan cables are connected.

   Connect all fan cables.

3. Inspect vents and fan airways for obstructions. Look underneath cabinet models for items blocking the cabinet exhaust vents.

   Remove any obstructions from vents and airways.

4. Install paper path or pedestal top cover. Load paper. Power on the printer. Run the “All Black” print test for 1/4 page.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PROTECTED INSTR* Message

1. Protected Instruction. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

PWR SUPP VOLT* Message

1. Power Supply Voltage. The power supply has failed.

   Replace the power supply board.

QUEUE OVERRUN Message

1. In the CT twinax emulation, the print buffer has overflowed. Send a print job to the printer.

   If the message appears, replace the expansion-CT board. Record the message and return it with defective board.

2. Send a print job to the printer.

   If the message appears, replace the twinax data cable and the twinax auto-termination cable assembly (“Smart T”).

RESTORING

BOOT CODE Message

1. Normal download initialization message.

   No action required.

Reverse paper feed: platen does not open

1. Raise the forms thickness lever and check that the platen opens.

   If the platen opens with difficulty, inspect for and remove jams or obstructions.

2. Check the platen open pulley and the platen pulley for looseness.

   Bottom out the platen open motor pulley on the motor shaft and torque the 1/16 inch set screw to 9 ± 2 inch-pounds (1.02 ± 0.23 N•m). Tighten the 7/64 inch setscrew in the platen shaft pulley, then open and close the forms thickness lever and check that the platen pulley setscrew does not hit the left ribbon guide.

3. Check the condition and tension of the platen open belt.

   Adjust the platen open belt. Replace the belt if it is damaged.

4. Check the platen gap.

   Adjust the platen gap.

5. Power off the printer. Remove the paper guide assembly. Disconnect connector P106 from the CMX controller board. Check the resistance of connector P106/PLAT M. (Refer to the Main Wire Harness Test Tables in Appendix A.)

   Replace the platen open motor if it fails the resistance test.

6. Power on the printer. Press **PAPER ADVANC**E and **VIEW** several times and check that paper moves in both directions.

   Replace the CMX controller board if the platen does not open during paper reverse.

Randomly misplaced dots

1. Power off the printer. Check the platen gap.

   Adjust the platen gap.

2. Remove the paper guide assembly or pedestal top cover. On the left rear wall of the card cage, make sure the nut which secures the line filter ground line and the AC In Power Supply cable lead to the ground stud is tight. (See Figure 42, page 232.)

   Tighten the nut on the ground stud.

3. Disconnect the AC power cord and check the ground leads for continuity.

   Replace the AC power cord if it fails continuity test.

4. Make sure the printer is plugged in to a grounded power outlet. Power up the printer. Run a print test.

   If the problem occurs, replace the hammer bank logic cable.

5. Power up the printer. Run a print test.

   If the problem occurs, replace the flash memory and DRAM. Download the emulation software again (page 130).

6. Power up the printer. Run a print test.

   If the problem occurs, replace the CMX controller board.

7. Power up the printer. Run a print test.

   If the problem occurs, replace the power supply board.

8. Power up the printer. Run a print test.

   If the problem occurs, replace the shuttle frame assembly.

RIB INVLD CMD* Message

1. Ribbon Invalid Command. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

RIB INVLD STATE* Message

1. Ribbon Invalid State. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

RIBBON DRIVE Message

1. The CMX controller board does not detect a ribbon drive motor.

   Cycle power. If the message appears, power off the printer. Remove the paper path or pedestal top cover. Reseat the cable connections of both ribbon drive motors.

2. Power on the printer. Using a screwdriver, short across the ribbon guide screws to reverse ribbon hub motion. Check for a ribbon drive motor that will not wind the ribbon.

   If the ribbon will not wind in one or both directions, replace the defective ribbon drive motor(s). If the ribbon winds in both directions, replace the CMX controller board. Record the message and return it with defective CMX board.

Ribbon folding or feed problems

1. Check that both ribbon spools are fully seated on the ribbon hubs and the ribbon runs between the ribbon mask and hammer bank cover.

   Install the ribbon correctly.

2. Check that the ribbon spools are not rubbing against the shuttle cover assembly.

   Install the shuttle cover assembly correctly, so that the ribbon spools do not rub against it.

3. Inspect the paper print path for paper chaff, ink residue, and debris.

   Clean the shuttle frame assembly.

4. Power on the printer. Run a print test and observe ribbon movement across the left and right ribbon guides.

   Adjust the right and left ribbon guides.

5. Observe ribbon movement at both left and right ribbon posts as the metal end strip crosses each ribbon post.

   If the metal strip moves past either post without reversing the direction of the ribbon, power down the printer. Remove the paper path or pedestal top cover. Reseat connectors P106/LRP and P107/RRP on the CMX controller board.

6. While shorting across each ribbon post with the ribbon metal strip or a screwdriver, check for continuity in connector P106/LRP pins 10 and 12, and connector P107/RRP pins 14 and 16. (Refer to the Main Wire Harness Test Tables in Appendix A.)

   Replace a ribbon post that fails the continuity test.

7. Check the platen gap.

   Adjust the platen gap.

RIBBON INK OUT
CHANGE RIBBON Message

1. RibbonMinder™ software has determined that the ribbon is out of ink.

   Install a new ribbon and set ribbon life to 100%.

SCS COMMAND ERROR Message

1. In the CT emulation, the printer received undefined control character (hex 40).

   The printer clears the error.

2. Run the print job that generated the error message.

   If the message appears, verify that there are no invalid control codes in the host data.

3. Ask the system operator to verify that the printer's Device ID is set to the correct emulation with respect to the host configuration.

   Set the printer Device ID to the correct emulation with respect to the host configuration.

4. Run the print job that generated the error message.

   If the message appears, go to **Communications Failures**, page 88.

SECURITY PAL NOT DETECTED Message

1. The security PAL is missing or has failed. Power off the printer. Remove the paper path or pedestal top cover.

   Check the security PAL at location U54 on the CMX controller board. If the PAL is absent, install the correct PAL. If security PAL is present, replace the CMX controller board. Record the message and return it with defective CMX board.

SECURITY CODE VIOLATION Message

1. Security code of the PAL on the CMX controller board does not match the code of the firmware on the CMX controller board. Remove the paper path or pedestal top cover. Check that the security PAL is correctly installed.

   Install correct PAL for the customer's emulations with the notched end facing toward the flash and DRAM SIMM sockets.

2. Run a print test.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

SENDING PROGRAM TO EC PROCESSOR Message

1. Status message: the printer is loading the engine controller program into the engine controller.

   No action required.

SF ERROR Message

1. Structured Field Error. Application software has violated structured data field parameters.

   Not a printer problem. Have the system administrator correct applications data or configuration.

Shuttle does not move

1. Power down the printer. Remove the shuttle cover. Check the MPU gap.

   Adjust the gap between the MPU assembly and the flywheel to 0.010 ± .001 inch (0.254 ± 0.025 mm). Torque the 7/16 inch MPU clamp screw to 18 ± 1 inch-pounds (2.03 ± 0.11 N•m).

2. Check that the MPU cable is connected to J03 on the mechanism base. Check that the shuttle motor cable is connected to J02 on the mechanism base.

   Connect the MPU and the shuttle motor cables.

3. Remove the paper path or pedestal top cover. Check that the shuttle motor drive cable is connected to J116 on the CMX controller board.

   Connect the shuttle motor drive cable.

4. Check the platen gap.

   Adjust the platen gap.

5. Inspect the ribbon mask for bends or deformation that snag and interfere with shuttle movement. Make sure the hammer bank cover assembly is correctly installed on its mounting pegs.

   Reinstall the hammer bank cover assembly. Replace a damaged or deformed hammer bank cover assembly.

6. Check continuity of the shuttle motor drive cable assembly.

   Replace shuttle motor drive cable assembly if it fails continuity test.

7. Power up the printer. Run a Shuttle Slow or Shuttle Fast test.

   If the shuttle does not move, replace the shuttle frame assembly.

8. Power up the printer. Run a Shuttle Slow or Shuttle Fast test.

   If the shuttle does not move, replace the power supply board.

9. Power up the printer. Run a Shuttle Slow or Shuttle Fast test.

   If the shuttle does not move, replace the CMX controller board.

SHUTL INV CMD* Message

1. Shuttle Invalid Command. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

SHUTL INV PARM* Message

1. Shuttle Invalid Parameter. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

Shuttle is noisy

1. Check the bolts securing the mechanism base to the base pan.

   Tighten the mechanism base mounting bolts if they are loose enough to permit movement of the mechanism base.

2. Remove the shuttle cover. Check the shuttle frame assembly mounting/ clamp screws for looseness.

   Torque the 5/32 inch socket head clamp screws to 20 ± 2 inch-pounds (2.26 ± 0.23 N•m). Torque the center captive 5/32 inch socket head screw to 20 ± 2 inch-pounds (2.26 ± 0.23 N•m).

3. Inspect the shuttle area for loose hardware.

   Tighten loose hardware.

4. Check that the hammer bank cover assembly is correctly installed, that it has not slipped off the mounting pegs. Check that the ribbon mask has not partially separated from the hammer bank cover. Check for debris trapped between the ribbon mask, hammer bank cover, and hammer bank.

Clean the shuttle frame assembly and hammer bank cover assembly if you find debris. Replace the hammer bank cover assembly if you find any damage to the ribbon mask or hammer bank cover.

5. Power up the printer. Run a shuttle test.

   Replace the shuttle frame assembly if it is noisy or rattles.

SHUTTLE JAM Message

1. The shuttle is not moving or is moving at the wrong speed. Check the forms thickness lever: if it is set too tightly, it can slow the shuttle enough to trigger the fault message.

   Set the forms thickness lever to match the thickness of paper and provide satisfactory print quality, but not too tightly.

2. Check the platen gap.

   Adjust the platen gap.

3. Inspect the ribbon mask for bends or deformation that snag and interfere with shuttle movement. Make sure the hammer bank cover assembly is correctly installed on its mounting pegs.

   Reinstall the hammer bank cover assembly. Replace a damaged or deformed hammer bank cover assembly.

4. Run a print test.

   If the message appears, power off the printer.

5. Remove the shuttle cover. Remove the paper path or the pedestal top cover. Inspect the shuttle mechanism for obstructions. Check that all cables are attached at the shuttle and the CMX controller board. Make sure the MPU cable is not pinched. (Refer to the Interconnection Diagrams in Appendix A.)

   Remove obstructions and reseat all cables. Check the resistance of the MPU at connector P107. (Refer to the Main Wire Harness Test Tables in Appendix A.) Replace the MPU if it fails the test.

6. Run a shuttle test and observe shuttle movement.

   If the shuttle oscillates too slowly, adjust the gap between the MPU assembly and the flywheel to 0.010 ± .001 inch (0.254 ± 0.025 mm). Torque the 7/16 inch MPU clamp screw to 18 ± 1 inch-pounds (2.03 ± 0.11 N•m).

7. Run a print test.

   If the message appears, replace the MPU and the MPU cable assembly.

8. Run a print test.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

9. Run a print test.

   If the message appears, replace the power supply board.

10. Run a print test.

If the message appears, replace the shuttle frame assembly.

SOFTWARE ERROR*

Cycle power Message

1. Application software tried to perform an illegal printer function or damaged logic circuits were detected on the CMX controller board.

   Cycle power. If the message appears, power off the printer.

2. Disconnect the input data line from the host computer. Power on the printer.

   If the message appears, download the emulation software again (page 130).

3. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. If the message is gone, there is an application software error. Request assistance from your local support group.

STACK OVERFLOW* Message

1. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

STACK UNDERFLOW* Message

1. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

Stacker “chatters” at upper or lower limit

1. Power off the printer. Unload paper. Open the rear cabinet door and check that stacker motion is not obstructed by the control panel cable or other obstruction.

   Remove obstruction or reroute the stacker control panel cable as necessary.

2. Verify that the stacker rails are vertical and parallel.

   Adjust the stacker rails if necessary: they must be vertical and parallel.

3. Move the elevator up and down by hand and check that the limit switches are being tripped at the highest and lowest limits of elevator travel.

   Adjust the limit switches, if necessary, by gently bending the contact arms. Replace switches that cannot be adjusted.

4. Power on the printer. Operate the power stacker. (Refer to the *Operator's Guide*.) While the stacker is operating, check that:
   a) all motors are operating
   b) the paddles are rotating
   c) the elevator moves smoothly and without obstruction
   d) the timing belts are undamaged and the belt pulleys are not slipping
   e) the extension springs are attached and undamaged (not bent or stretched)
   f) the drive rollers are not damaged
   g) the constant force springs are tightly mounted and undamaged

   Tighten pulley setscrews and/or replace damaged components as necessary.

Stacker does not stack properly

—or—

Stacker elevator does not move

1. Check for obstructions preventing elevator movement.

   Remove obstructions.

2. Check for misaligned stacker rails

   Adjust the stacker rails if they are not vertical and parallel.

3. Power on the printer. Operate the power stacker. (Refer to the *Operator's Guide*.) While the stacker is operating, check that:
   a) all motors are operating
   b) the paddles are rotating
   c) the elevator moves smoothly and without obstruction
   d) the timing belts are undamaged and the belt pulleys are not slipping
   e) the extension springs are attached and undamaged (not bent or stretched)
   f) the drive rollers are not damaged
   g) the constant force springs are tightly mounted and undamaged

   Tighten pulley setscrews and/or replace damaged components as necessary.

4. Check the stacker limit switches. (See page 83.)

   If the limit switches are OK, go to the next step.

5. Check the stacker motors. (See page 84.)

   If the stacker motors are OK, go to the next step.

6. Remove the paper path. Disconnect stacker cables from the CMX controller board, stacker assembly, and the stacker control panel (see Figure 59, page 313). Check cables for cuts, breaks, or damaged pins. Check continuity of cables. (See Appendix A.)

Replace any cable that is damaged or fails continuity test. Reconnect all stacker cables to the CMX controller board, stacker, and stacker control panel.

Stacker elevator moves by itself

1. Power off the printer. Inspect all stacker LEDs for dust, chaff, or dirt. (See Figure 81 through Figure 83, page 338 through page 342.)

   Clean the stacker LEDs and the sight tubes in the LED mounts.

2. Power on the printer.

   If the stacker elevator moves by itself, replace the stacker LEDs. (See Figure 81 through Figure 83, page 338 through page 342.)

STACKER FAULT Message

NOTE: This message is triggered when the elevator cannot reach either the top or bottom position switch before timing out.

1. Power on the printer. Operate the power stacker. (Refer to the *Operator's Guide.* Check for obstructions preventing elevator movement.

   Remove obstructions.

2. Operate the power stacker. While the stacker is operating, check that:
   a) all motors are operating
   b) the paddles are rotating
   c) the elevator moves smoothly and without obstruction
   d) the timing belts are undamaged and the belt pulleys are not slipping
   e) the extension springs are attached and undamaged (not bent or stretched)
   f) the drive rollers are not damaged
   g) the constant force springs are tightly mounted and undamaged

   Tighten pulley setscrews and/or replace damaged components as necessary.

3. Check for misaligned stacker rails

   Adjust the stacker rails if they are not vertical and parallel.

4. Check the stacker limit switches. (See page 83.)
   If the limit switches are OK, go to the next step.

5. Disable the power stacker unit under the Printer Control menu. (Refer to the *Setup Guide.)*

   If the message occurs, replace the CMX controller board.

6. Power off the printer. Remove the paper path. Disconnect stacker cables from the CMX controller board, stacker assembly, and the stacker control panel (see Figure 59, page 313). Check cables for cuts, breaks, or damaged pins. Check continuity of cables. (See Appendix A.)

   Replace any cable that is damaged or fails continuity test. Reconnect all stacker cables to the CMX controller board, stacker, and stacker control panel.

STACKER FULL Message

1. Status message: the power paper stacker is full.

   Unload the stacker.

2. Check the stacker limit switches. (See page 83.)

   If the limit switches are OK, go to the next step.

3. Power off the printer. Remove the paper path. Disconnect stacker cables from the CMX controller board, stacker assembly, and the stacker control panel (see Figure 59, page 313). Check cables for cuts, breaks, or damaged pins. Check continuity of cables. (See Appendix A.)

   Replace any cable that is damaged or fails continuity test. Reconnect all stacker cables to the CMX controller board, stacker, and stacker control panel.

STACKER JAM Message

1. Paper is bunching above the elevator or the paper motion detector is not working properly.

   Remove the paper jam.

2. Power off the printer. Check that the wheel of the stacker paper motion detector rests against the rear brace of the paper throat. Also make sure the wheel rotates freely on its axle.

   If necessary, gently bend the brace toward the paper motion detector wheel until the wheel contacts the brace. Clean the stacker paper motion detector.

3. Power on the printer. Operate the power stacker. (Refer to the *Operator's Guide.)* While the stacker is operating, check that:
   a) all motors are operating
   b) the paddles are rotating
   c) the elevator moves smoothly and without obstruction
   d) the timing belts are undamaged and the belt pulleys are not slipping
   e) the extension springs are attached and undamaged (not bent or stretched)
   f) the drive rollers are not damaged

   Tighten pulley setscrews and/or replace damaged components as necessary.

4. Power off the printer. Remove the paper path. Disconnect stacker cables from the CMX controller board, stacker assembly, and the stacker control panel (see Figure 59, page 313). Check cables for cuts, breaks, or damaged pins. Check continuity of cables. (See Appendix A.)

   Replace any cable that is damaged or fails continuity test. Reconnect all stacker cables to the CMX controller board, stacker, and stacker control panel.

Stacker limit switch check

NOTE: This procedure tests the motion limit switches at the top and bottom of the vertical rails. You will usually be referred to this procedure from

other troubleshooting procedures. When you have completed this procedure, return to the procedure that sent you here.

1. Power off the printer. Open the rear cabinet door. Unload the power stacker. Move the elevator up and down by hand, checking that it moves smoothly and without chattering or shuddering.

   Eliminate causes of chattering or shuddering. (E.g., loose, damaged, or broken constant force springs, bent or misaligned rails, obstructions, etc.)

NOTE: If the elevator assembly or the rails are bent or damaged, you must replace the entire power stacker assembly.

2. Move the elevator up and down by hand. Check that the limit switches are physically tripped when elevator reaches top and bottom of travel.

   If necessary, gently bend the contact arms to adjust limit switches. If you cannot adjust a switch that requires adjustment, replace it.

3. a) Unfasten the cable clamp holding the stacker control panel cables.
   b) Disconnect stacker rail cable connector P107 from connector J3 on the back of the stacker control panel. (See Figure 59, page 313.)
   c) Locate pin 1 of connector P107. (See the cable assembly drawing in Appendix A, page 263.)
   d) Check the stacker rail cable and limit switches for continuity and shorts. Check continuity of the switch when open and closed. (See the power stacker control panel PCBA pinout drawing on in Appendix A, page 270. STK FULL is the upper limit switch, STK LIMIT is the bottom switch.)

   Replace the stacker rail cable if it is damaged or fails continuity test. Replace any switch that fails continuity test.

Stacker motor check

NOTE: This procedure tests the four stacker motors and their cables. You will usually be referred to this procedure from other troubleshooting procedures. When you have completed this procedure, return to the procedure that sent you here.

1. a) Power off the printer.
   b) Open the rear cabinet door.
   c) Unfasten the cable clamp holding the stacker control panel cables.
   d) Disconnect stacker rail cable connector P107 from connector J3 on the back of the stacker control panel. (See Figure 59, page 313.)
   e) Disconnect stacker frame cable connector P102 from connector J4 on the rear of the stacker control panel. (See Figure 59, page 313.)
   f) Locate pin 1 of connector P102 and connector P107. (See the cable assembly drawings in Appendix A, page 291 and page 294.)
   g) Check both cables for pin damage, continuity, and shorts. Check all motors for 15.2 ± 1.5 Ohms on both phases. (Refer to the power stacker control panel PCBA pinout drawing on page 270.)

   Replace any cable that is damaged or fails continuity test.
   Replace any motor that fails the resistance test.

TABLE MISMATCH

DOWNLOAD AGAIN Message

1. This message indicates that an EC software update is in process.

   Power off the printer. Download the program again from the beginning (page 130).

TCB CORRUPTED* Message

1. Task Control Block Corrupted. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

TOF is lost repeatedly

1. Check that the customer is setting the forms length to match the size paper used.

   Set the forms length to match the length of paper being used.

2. If the customer is using multi-part forms, check that the forms thickness lever is not being set too tightly.

   Set the forms thickness lever to match the thickness of paper and provide satisfactory print quality, but not too tightly.

3. Check the paper feed motor pulley for looseness. Make sure the correct pulley is being used: it should have 25 teeth.

   Hold the collar snug against the motor pulley and torque the 7/64 inch setscrew to 25 ± 2 inch-pounds (2.82 ± 0.23 N•m). Replace the paper feed pulley if it does not have 25 teeth.

4. Check the condition and tension of the paper feed timing belt.

   Adjust the paper feed timing belt. Replace the belt if it is damaged.

5. Remove the paper path or pedestal top cover. Make sure connector P107/PAPR M is fully seated in connector J107 on the CMX controller board.

   Connect P107/PAPR M to J107 on the CMX controller board.

6. Power on the printer. Load paper and set TOF. Press **PAPER ADVANCE** and **VIEW** several times and check that paper returns to TOF.

   Replace the paper feed motor if paper does not return to TOF.

7. Power on the printer. Press **PAPER ADVANCE** and **VIEW** several times and check that paper returns to TOF.

   Replace the CMX controller board if paper does not return to TOF.

UNDEF INTERRUPT* Message

1. Undefined Interrupt. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

UNDFNED OPCODE* Message

1. Undefined Opcode. Firmware error on the CMX controller board.

   Cycle power. Run the print job again. If the message appears, download the emulation software again (page 130).

2. Cycle power. Run the print job again.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

UP DRV. SHORT* Message

1. Upper Driver Short. Hammer driver circuits on the CMX controller board are shorted to ground.

   Cycle power. If the message appears, press **CLEAR**. If the message does not clear, replace the hammer bank logic cable and the hammer bank power cable assemblies.

2. Power on the printer.

   If the message appears, replace the CMX controller board. Record the message and return it with defective CMX board.

3. Power on the printer.

   If the message appears, replace the shuttle frame assembly.

Vertical misalignment of characters:

- Dots or characters move up or down from dot row to dot row or line to line

- Incorrect spacing from dot row to dot row or line to line

- Characters randomly compressed and/or enlarged

1. Load paper. Press **PAPER ADVANCE** and check that paper feeds smoothly. Press **VIEW** to verify that paper moves in both directions. Check the forms thickness lever: if it is set too loose or too tightly print quality can be affected.

   Set the forms thickness lever to match the thickness of the paper being used.

2. Check the paper feed motor pulley for looseness.

Hold the collar snug against the motor pulley and torque the 7/64 inch setscrew to 25 ± 2 inch-pounds (2.82 ± 0.23 N•m).

3. Check the condition and tension of the paper feed timing belt.

   Adjust the paper feed timing belt. Replace the belt if it is damaged.

4. Check the platen gap.

   Adjust the platen gap.

5. Inspect the tractors and tractor door springs for damage or excessive wear.

   If either tractor is damaged or excessively worn, replace both tractor assemblies.

6. Remove the paper guide assembly or pedestal top cover. Make sure connector P107/PAPR M is fully seated in connector J107 on the CMX controller board.

   Connect P107/PAPR M to J107 on the CMX controller board.

7. Load paper. Power on the printer. Run a print test.

   If the problem occurs, replace the paper feed motor.

8. Run a print test.

   If the problem occurs, replace the CMX controller board.

9. Run a print test.

   If the problem occurs, replace the power supply board.

Communications Failures

Many host-printer communications problems are complex. With the exception of a defective interface cable, most communications problems are not a result of a hardware failure. They usually result from an incompatible configuration of the host computer system, network (LAN, print server, controller, multiplexer, etc.), or the printer. Sometimes the print application program itself is at fault.

If you have limited communications experience, and the cause of the problem is not readily apparent, do the following:

1. Print out the printer configuration.
2. Obtain a copy of the Device Host Configuration if possible.
3. Call your support group for assistance in problem analysis.

If you cannot obtain support, or you have experience solving host-printer communications problems, the following additional information is provided.

You can quickly check the ASCII portion of the printer logic by sending a plain text file from a PC to the printer via the parallel or serial port. For a description of each of the ASCII interfaces, refer to the *User's Manual.*

Table 4: Common Communications Problems

Problems	Interface	Common Causes
Fails to print from host -or- Prints incorrect characters -or- Prints extra characters -or- Drops characters	parallel	- Interface cable defective - Host/Network configuration - Printer logic - Terminating Resistors
	serial	- Host/Printer interface cable pinouts incompatible - Host/Printer/Network configuration - Set DTR and RTS both True - Interface cable defective - Printer logic
	twinax	- Interface cable defective - Host-Printer definition - Controller/Network configuration - Printer logic
	coax	- Interface cable defective - Controller/Network configuration - Printer logic

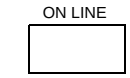
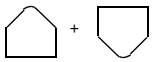
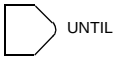
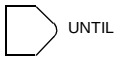
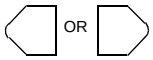
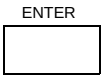
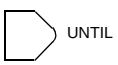
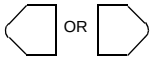
Diagnostic Printer Tests

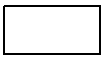
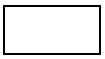
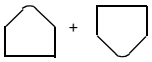
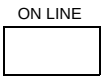
A set of printer tests is included in the configuration menu structure for use as diagnostic tools. Use these printer tests to check the print quality and basic operation of the printer. You will also use some of the tests in some adjustment procedures. The diagnostic printer tests are summarized below:

- **Shift Recycle** — A “sliding” alphanumeric pattern useful for identifying missing or malformed characters, improper vertical alignment, or vertical compression.
- **All E’s** — A pattern of all uppercase letter E’s useful for identifying missing characters, misplaced dots, smeared characters, improper phasing, or light/dark character variations.
- **E’s + TOF** — A pattern of all E’s repeated for ten lines and followed by a form feed to the top of the next page. This test is useful for identifying paper motion or paper feed problems.
- **All H’s** — A pattern of all uppercase letter H’s useful for detecting missing characters or dots, smeared characters, or improper phasing.
- **Underline Only** — An underline pattern useful for identifying hammer bank misalignment.
- **All Black** — Prints all dot positions, creating a solid black band. Exercises the shuttle and hammer bank at maximum capacity.
- **Shuttle Slow** — Exercises the shuttle and ribbon mechanisms at low speed. You can also use this test to check ribbon tracking and reversing.
- **Shuttle Fast** — Exercises the shuttle and ribbon mechanisms at high speed. You can also use this test to check ribbon tracking and reversing.
- **Shuttle Only** — Runs the shuttle mechanism with no ribbon movement.
- **Phase Printer** — A hammer timing test that permits you to adjust the hammer phase value. The hammer phase value is a timing parameter that controls the vertical alignment of dots in character printing. The numerical units are relative, they do not represent a physical measurement or value. There is no “correct” value or range. The factory prints the initial phase value on the casting of the shuttle assembly, next to the motor housing. Use this value as your starting point when adjusting hammer phasing.
- **Paperout Adj.** — Prints a vertical comb pattern. You use this pattern when you do the end of forms (paper out) adjustment procedure. The comb pattern lets you measure the number of dot rows from the completion of a paper out fault to the end of the paper.
- **Burnin Test** — Do not use. This test is used by the printer manufacturer to burn in the printer prior to shipment and has no value as a maintenance tool.

Selecting and Running Diagnostic Printer Tests

NOTE: You must set TOF after running any diagnostic test.

Step	Press	LCD Result	Notes
1.	Make sure the printer is on. Raise the printer cover.		
2.	Load paper.		
3.	Set TOF. (Refer to the *User's Manual*.)		
4.		OFFLINE CONFIG. CONTROL	The printer must be off-line to run a print test.
5.		ENTER SWITCH UNLOCKED	Unlocks **ENTER** key and control panel.
		OFFLINE CONFIG. CONTROL	
6.		OFFLINE DIAGNOSTICS	
7.		DIAGNOSTICS Printer Tests	
8.		DIAGNOSTICS Test Width	
9.		Test Width Full Width*	
10.		Test Width X	Cycle through choices. X = Full Width or X = 80 columns.
11.		Test Width X*	Test width is selected.
12.		DIAGNOSTICS Test Width	
13.		DIAGNOSTICS Printer Tests	
14.		Printer Tests Shift Recycle*	
15.		Printer Tests All E's	Cycle through the choices.

Step	Press	LCD Result	Notes
16.	ENTER 	Printer Tests All E's*	Starts test.
17.	ENTER 	Printer Tests All E's*	Stops test.
18.		ENTER SWITCH LOCKED	Locks the **ENTER** key and control panel.
19.	ON LINE 	ONLINE LinePrinter+	Places the printer in on-line mode.
20.	Examine print quality. Characters should be fully formed and of uniform density.		
21.	Set TOF. (Refer to the *User's Manual*.)		

Boot Diagnostics Menu

Printer boot-up software contains a “Boot Diagnostics” menu that you can access by holding down two keys while powering on the printer. This menu is not intended for the end user, but provides useful information for manufacturing and maintenance personnel.

The boot diagnostics menu is a multi-level menu that operates the same way as the user menus. The menu structure is shown in Figure 8 on page 93.

Activating the Boot Diagnostics Menu

1. Set the printer power switch to O (off).
2. On cabinet models, raise the printer cover.
3. On the control panel, press and hold down ◄ **(PREV) +** ▼ **(DOWN)**.
4. While holding ◄ **(PREV) +** ▼ **(DOWN)**, set the printer power switch to 1 (on).
5. When “BOOT DIAGNOSTICS / PRESS ENTER” appears on the LCD, release the ◄ **(PREV) +** ▼ **(DOWN)** keys.
6. Press the **ENTER** key. Menu options are shown in Figure 8.

Exiting the Boot Diagnostics Menu

Method 1: Resetting the printer from the Boot Diagnostics Menu

1. Using the directional keys, move to the MISC UTILITIES / RESET PRINTER menu option. (Refer to the menu map on page 93.)
2. Press the **ENTER** key.

Method 2: Cycling power

1. Power off the printer.
2. Wait 15 seconds.
3. Power on the printer.

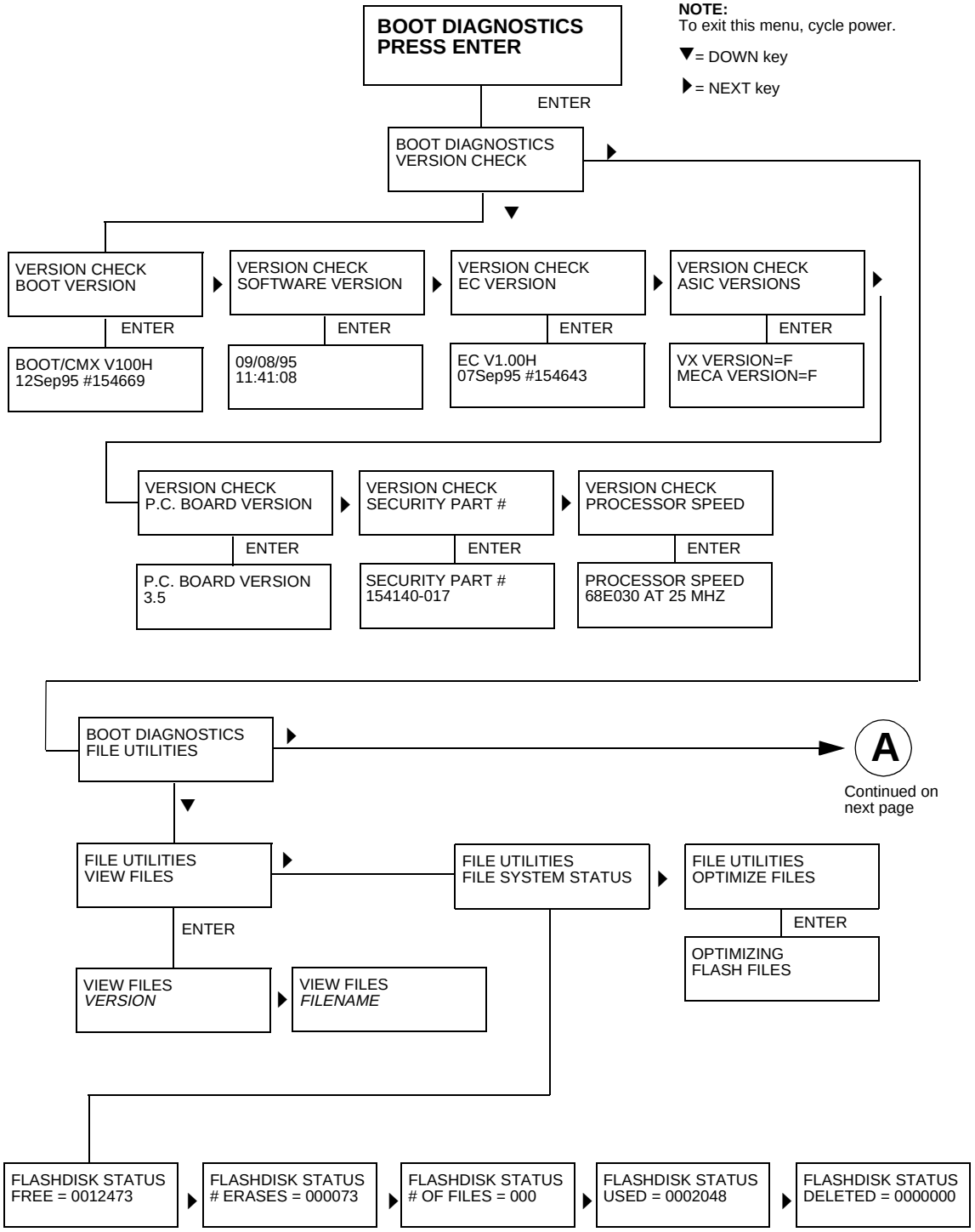


Figure 8. Boot Diagnostics Menu

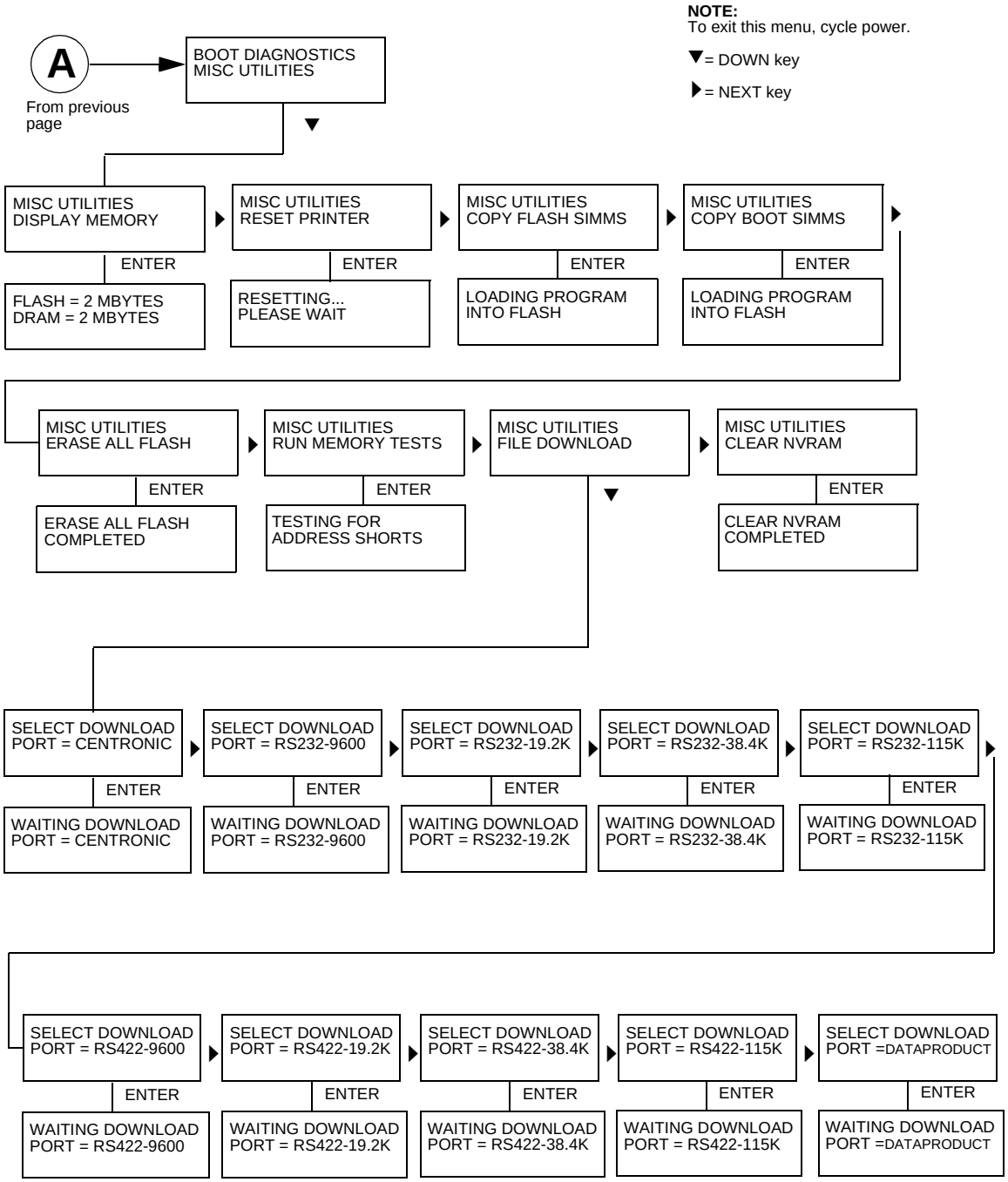


Figure 10. Boot Diagnostics Menu (continued)

Hex Code Printout

A hex code printout (or “hex dump”) prints every ASCII data character received from the host computer, and lists its corresponding two-digit hexadecimal code. (See Figure 9 below.) You can use hex dumps as an aid in troubleshooting data reception problems.

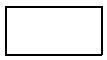
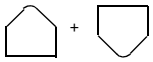
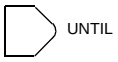
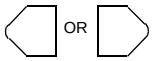
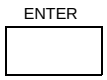
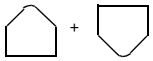
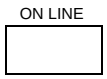
In a hex dump every printable character is printed both as its assigned symbol and as its hex equivalent. Every unprintable (ASCII control) character is printed out as a period (.) and its hex equivalent. If the printer is using a parallel interface, the letter “p” before a hex code indicates an active Paper Instruction (PI) line, and a blank space before a hex code indicates an inactive PI line.

To convert an ASCII character to its corresponding hex code, or vice versa, refer to the ASCII code chart on page 97. To make a hex code printout, refer to the procedure on page 96.

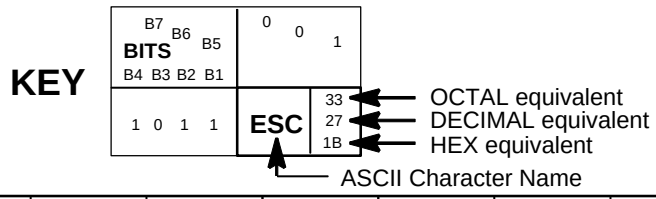
```
 !"#$%&'()*+,-./ 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F
0123456789:;<=>? 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
@ABCDEFGHIJKLMNO 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F
PQRSTUVWXYZ[\]^_ 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F
`abcdefghijklmno 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F
pqrstuvwxyz{|}~  70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 20
!"#$%&'()*+,-./0 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30
123456789:;<=>?@ 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F 40
ABCDEFGH..!"#$%& 41 42 43 44 45 46 47 48 0D 0A 21 22 23 24 25 26
'()*+,-./0123456 27 28 29 2A 2B 2C 2D 2E 2F 30 31 32 33 34 35 36
789:;<=>?@ABCDEF 37 38 39 3A 3B 3C 3D 3E 3F 40 41 42 43 44 45 46
GHIJKLMNOPQRSTUV 47 48 49 4A 4B 4C 4D 4E 4F 50 51 52 53 54 55 56
WXYZ[\]^_`abcdef 57 58 59 5A 5B 5C 5D 5E 5F 60 61 62 63 64 65 66
ghijklmnopqrstuv 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76
wxyz{|}~ !"#$%&' 77 78 79 7A 7B 7C 7D 7E 20 21 22 23 24 25 26 27
()*+,-./01234567 28 29 2A 2B 2C 2D 2E 2F 30 31 32 33 34 35 36 37
89:;<=>?@ABCDEFG 38 39 3A 3B 3C 3D 3E 3F 40 41 42 43 44 45 46 47
HI..”#$%&'()*+,- 48 49 0D 0A 22 23 24 25 26 27 28 29 2A 2B 2C 2D
./0123456789:;<= 2E 2F 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D
>?@ABCDEFGHIJKLM 3E 3F 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D
NOPQRSTUVWXYZ[\] 4E 4F 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D
^_`abcdefghijklm 5E 5F 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D
nopqrstuvwxyz{|} 6E 6F 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D
~ !"#$%&'()*+,-. 7E 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E
/0123456789:;<=> 2F 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E
?@ABCDEFGHIJ..#$ 3F 40 41 42 43 44 45 46 47 48 49 4A 0D 0A 23 24
%&'()*+,-./01234 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30 31 32 33 34
56789:;<=>?@ABCD 35 36 37 38 39 3A 3B 3C 3D 3E 3F 40 41 42 43 44
EFGHIJKLMNOPQRST 45 46 47 48 49 4A 4B 4C 4D 4E 4F 50 51 52 53 54
UVWXYZ[\]^_`abcd 55 56 57 58 59 5A 5B 5C 5D 5E 5F 60 61 62 63 64
efghijklmnopqrst 65 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74
uvwxyz{|}~ !"#$% 75 76 77 78 79 7A 7B 7C 7D 7E 20 21 22 23 24 25
&'()*+,-./012345 26 27 28 29 2A 2B 2C 2D 2E 2F 30 31 32 33 34 35
6789:;<=>?@ABCDE 36 37 38 39 3A 3B 3C 3D 3E 3F 40 41 42 43 44 45
FGHIJK..$%&'()*+ 46 47 48 49 4A 4B 0D 0A 24 25 26 27 28 29 2A 2B
,-./0123456789:; 2C 2D 2E 2F 30 31 32 33 34 35 36 37 38 39 3A 3B
<=>?@ABCDEFGHIJK 3C 3D 3E 3F 40 41 42 43 44 45 46 47 48 49 4A 4B
LMNOPQRSTUVWXYZ[ 4C 4D 4E 4F 50 51 52 53 54 55 56 57 58 59 5A 5B
\]^_`abcdefghijk 5C 5D 5E 5F 60 61 62 63 64 65 66 67 68 69 6A 6B
lmnopqrstuvwxyz{ 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79 7A 7B
|}~ !"#$%&'()*+, 7C 7D 7E 20 21 22 23 24 25 26 27 28 29 2A 2B 2C
```

Figure 9. Sample Hex Dump

How to Print a Hex Dump

Step	Press	LCD Result	Notes
1.	Make sure the printer is on. Raise the printer cover.		
2.		OFFLINE CONFIG. CONTROL	
3.		ENTER SWITCH UNLOCKED	Unlocks **ENTER** key and control panel.
		OFFLINE CONFIG. CONTROL	
4.		OFFLINE MAINT / MISC	
5.		MAINT / MISC Hex Dump Mode	
6.		Hex Dump Mode Disable*	Default
7.		Hex Dump Mode Enable	Cycle through choices.
8.		Hex Dump Mode Enable*	Asterisk (*) indicates choice is active.
9.		ENTER SWITCH LOCKED	Locks the **ENTER** key and control panel.
10.		ONLINE LinePrinter+	Places the printer in on-line mode.
11.	Send a file from the host computer. the printer outputs a hex dump. Refer to the ASCII chart on page 97.		
12.	When the hex dump is complete, take the printer off-line and change the Hex Dump Mode back to Disable. Follow the steps outlined above and select Disable.		

ASCII Character Set



B7 B6 B5 / BITS B4 B3 B2 B1	ROW	0 0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1	
		COLUMN 0		1		2		3		4		5		6		7	
0 0 0 0	0	NUL	0 0 0	DLE	20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	`	140 96 60	p	160 112 70
0 0 0 1	1	SOH	1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	a	141 97 61	q	161 113 71
0 0 1 0	2	STX	2 2 2	DC2	22 18 12	"	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	b	142 98 62	r	162 114 72
0 0 1 1	3	ETX	3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	c	143 99 63	s	163 115 73
0 1 0 0	4	EOT	4 4 4	DC4	24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	d	144 100 64	t	164 116 74
0 1 0 1	5	ENQ	5 5 5	NAK	25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	e	145 101 65	u	165 117 75
0 1 1 0	6	ACK	6 6 6	SYN	26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	f	146 102 66	v	166 118 76
0 1 1 1	7	BEL	7 7 7	ETB	27 23 17	'	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	g	147 103 67	w	167 119 77
1 0 0 0	8	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	h	150 104 68	x	170 120 78
1 0 0 1	9	HT	11 9 9	EM	31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	i	151 105 69	y	171 121 79
1 0 1 0	10	LF	12 10 0 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	j	152 106 6A	z	172 122 7A
1 0 1 1	11	VT	13 11 0 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	k	153 107 6B	{	173 123 7B
1 1 0 0	12	FF	14 12 0 C	FS	34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	l	154 108 6C	|	174 124 7C
1 1 0 1	13	CR	15 13 0 D	GS	35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	m	155 109 6D	}	175 125 7D
1 1 1 0	14	SO	16 14 0 E	RS	36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	n	156 110 6E	~	176 126 7E
1 1 1 1	15	SI	17 15 0 F	US	37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F	DEL	177 127 7F

Soft vs. Hard Reset

Soft Reset

A soft(ware) reset clears printer memory then loads the power-up configuration set by the user. (If no power-up configuration has been set by the user, the factory default configuration is loaded.) It is called a soft reset because no hardware is tested. All diagnostic and initialization tests are bypassed and memory is simply refreshed with the power-up printer configuration.

The printer must be off-line to do a soft reset:

1. Press the **ON LINE** key to put the printer in the off-line state.
2. Press the ◀ **(PREV) +** ▶ **(NEXT)** keys simultaneously.

The LCD will display “Standby / Soft Reset” while the printer loads the power-up configuration.

Hard Reset (“Cycle Power”)

A hard(ware) reset is a power shutdown and restart that runs all initialization and diagnostic routines. This is also called “cycling power.”

1. Set the printer power switch to O (off).
2. Wait 15 seconds.
3. Set the printer power switch to 1 (on).

NOTE: A hard printer reset causes the +48V power supply (fans, motors, etc.) to shut down in 1 to 5 seconds, depending on the amount of memory installed on the controller board.

The Power On Sequence

This section describes the normal sequence of events from the time the power switch is set to 1 until ONLINE (or OFFLINE, if so configured by the user) appears on the LCD.

Use this sequence as a reference baseline to help you isolate problems that occur before the printer completes its boot and initialization routines.

The power on sequence consists of two sets of routines:

1. CMX controller board handshake sequences (DC hardware initialization)
2. DC software initialization and power up

The routines are listed below, in order of occurrence.

CMX Controller Board Handshake Sequences

- **Processor Alive** — The green LED marked CR1 on the CMX controller board is turned on to indicate that the processor received a valid reset vector and the first instructions to the processor are correct. This LED is used to report all DC errors and states.
- **Test VX Data Bus** — A walking zero and one test verifies that all 32 data lines from the VX bus to the processor are connected. If a bad line is detected, a 4-1-1-XX blink code is sent to the LED on the CMX controller, where XX is the data line plus 1. (For example, a bad data line 8 would blink as 4-1-1-9.)
- **Initialize VX ASIC** — The boot code detects the processor type and sets up the internal registers of the VX ASIC.
- **Initialize Debug Serial Port** — The boot code checks the validity of the debug serial parameters in NVRAM; if they are valid, it sets the baud rate, data type, and which messages should be sent out the debug port. If the values in NVRAM are not valid, boot code initializes NVRAM to 9600 baud, 8 data bits, one stop, bit, no parity bit, and standard messages.
- **Turn On Instruction Cache** — The instruction cache is turned on to help speed up memory tests and the entire boot process.
- **Enable DRAM Controller** — A DRAM controller is built into the VX ASIC. DRAM must be refreshed a few times to operate correctly. To speed the boot process, the refresh rate is temporarily increased. The message “TESTING HARDWARE PLEASE WAIT” is sent to the LCD, during which time the refreshes run and finish. At this point, the fans start. After sending the message, the refresh rate is set to the proper rate and DRAM is ready to be tested.
- **Test I/O Clock** — The VX ASIC has two clocks for internal timing, a processor clock and an I/O clock. The processor clock cannot be checked because the processor will not run without it, but the I/O clock can be checked. The I/O clock is used for sending data to the control panel and to get the time for DRAM refreshes. If the boot code detects a problem with the I/O clock, the error blink code 4-3-4 is sent to the diagnostic LED on the CMX board.

- **Read Control Panel Keys** — The control panel keys are read to determine if the user is requesting that the printer be placed in download mode, diagnostic mode, or debug SIMM disabled. If ON LINE and PAPER ADVANCE are pressed during start-up, the printer is placed in download mode. If ◄ **(PREV)** and ▼ **(DOWN)** are pressed during start-up, the printer is placed in diagnostic mode. If any other combination of keys are pressed, the debug SIMM is disabled. Key states are put in an internal register in the VX ASIC.
- **Detect DRAM** — The VX ASIC supports up to four banks of DRAM totalling up to 32 Megabytes. Boot code detects how much DRAM is located in each bank, and relocates the banks to create one contiguous block of DRAM. The size and location of each bank is then displayed on the debug terminal through the debug serial port.
- **Test DRAM** — DRAM is tested by writing a pseudo–random number sequence to all the DRAM, then reading the pattern back to verify it against what was originally written. If an error is detected, the message “ERROR: DRAM AT ADDRESS XXXXXXXX” is displayed on the LCD. When finished, the DRAM test sets all memory to zero.
- **Inform the EC Processor** — The first 8 Kilobytes of DRAM are reserved for the EC processor, which must be notified when DRAM is ready to be used. This is done by putting the message “DCS1” in the ECDC communications register in the VX ASIC.
- **Detect Ethernet Adapter** — An Ethernet adapter must be detected early in the power up sequence so the printer can tell the adapter it has been detected and continue with its own power up sequence. An Ethernet adapter takes a long time to complete its internal diagnostic tests, so the boot code allows the adapter to power up in parallel with the printer to reduce its effect on overall boot time.
- **Load Boot Messages** — The boot code scans flash memory for OEM boot messages and loads them into DRAM. The manufacturer’s boot code is the same for all OEMs, and contains a set of default messages. Boot messages for specific OEMs are stored in the DC code, not the boot code.
- **Load Boot Code into DRAM** — Flash memory cannot be accessed while flash is being detected, cleared, or programmed. This prevents boot code from running in flash because the opcodes cannot be fetched. This is solved by copying the program into DRAM and executing the program out of DRAM. The boot code is position-independent in order for the program to operate at a different address. The interrupt vector table is also move to DRAM and the vectors are changed to reflect the new address.
- **Detect Flash** — The boot code supports many different kinds of flash memory, permitting any mixture of flash in the four memory banks. The only requirement is that flash must exist in bank 0 and have boot code programmed on it. The boot code displays flash configuration, manufacturer’s part number, size, and start address out the debug serial port.
- **Display VX Registers** — The boot code displays the values of the VX registers out of the debug serial port.

- **Check for Pedestal** — Boot code uses the control panel to determine if the printer is a pedestal or floor cabinet model. Boot code needs to know the difference so the exhaust fan fault can be disabled on a pedestal model. “FAN DISABLED” is printed out at the debug serial port of a pedestal model.
- **Check for Download Mode** — Boot code checks whether the ON LINE and PAPER ADVANCE keys were pressed at power up. If so, the printer enters download mode. If not, the printer continues the boot routines.
- **Check for Diagnostics Mode** — Boot code checks whether the ◄ **(PREV)** and ▼ **(DOWN)** keys were pressed at power-up. If so, the printer enters the Boot Diagnostics menu. If not, the printer continues the boot routines.
- **Check for Remote Download Mode** — Boot code checks if the user remotely requested the printer to enter download mode. If so, the printer enters download mode. If not, the printer continues boot routines.
- **Check for Flash Optimize** — Boot code checks if the user requested the flash file system to be optimized at power up. If so, flash memory is optimized at this time. If not, the printer continues boot routines.
- **Check EC Program** — The EC calculates a checksum of the program stored in its flash memory. If there is problem with its program, the EC puts the message “nopg” in the ECDC communications register. If the boot code detects this message, it displays “ERROR: EC PROGRAM NOT VALID” on the LCD. If the EC processor does not respond within three seconds, the boot code sends “EC STOPPED AT STATE XXXX” to the LCD, where XXXX is one of these states:

State	Description
0000	Power up
0001	Enter checksum calculation
0002	Enter copy download code from FLASH into shared DRAM
0003	Enter programming FLASH mode
0004	Erase EC FLASH
0005	Program FLASH
0006	Finish programming FLASH
0007	Enter initialization of EC serial debug
0008	Enter EC firmware task initializations
0009	Enter power up coil diagnostic
000A	Start running normal EC firmware

- **Check Security PAL and NVRAM** — The chip select for NVRAM comes from the security PAL. If the PAL is not installed, NVRAM cannot be accessed, so the PAL is tested before NVRAM. If the security PAL is not

detected, boot codes displays “ERROR: SECURITY PAL NOT DETECTED”. If a security PAL is detected, boot code checks for the presence of NVRAM. If NVRAM is not found, boot code displays “ERROR: NVRAM FAILURE”.

- **Test for Powerup File** — Boot code checks for a DC executable file called powerup.sbr. If found, it executes the file, then returns to boot routines. If the file is not found, boot routines are resumed. If any key was held down during power up, boot code does not look for the powerup file and continues the boot sequence.
- **Automatic EC Update** — Boot code checks whether the automatic EC update feature is enabled by the DC program. If so, it looks for a copy of the EC program in the Flash File System. If it has a copy, it compares the program in EC flash to the program in the Flash File System, and updates the EC program if they are different. If the automatic EC update was not enabled, or if any key was held down during power up, automatic EC update is skipped and the boot sequence continues normally.
- **Debug SIMM** — The debug SIMM contains fast static RAM that automatically replaces the flash memory. Boot code checks for the debug SIMM and, if found, copies the contents of flash memory into the SIMM, then re-maps the address of the SIMM to the location of flash. This allows breakpoints and single–stepping from the MTOS debugger. When the debug SIMM is found, boot code displays “DEBUG SIMM ACTIVATED” on the panel and out the debug port.
- **Verify DC Program** — Boot code calculates a checksum at every power up to verify that the program has not been corrupted. If the checksum does not match, boot code displays “ERROR: DC PROGRAM NOT VALID”.
- **Check Security** — The security check verifies that security PAL supports the software that is loaded in flash memory. If the PAL does not support the software, boot code displays “SECURITY CODE VIOLATION”.
- **Check Required DRAM** — Boot code checks whether the amount of DRAM required to run the DC program is larger than the amount of DRAM in the printer. If so, it displays the message “ERROR: PROGRAM NEEDS MORE DRAM”.
- **Tell EC Processor to Finish Booting** — Boot code informs the EC processor that everything is okay and can finish booting up.
- **Diagnostics Passed** — If all tests pass, boot code displays “DIAGNOSTICS PASSED”. At this point, the ribbon motors engage. Boot code then jumps to the start address of the DC software.
- **Display DC Program Information** — Boot code sends the following information out the debug port: the compile time, date, and the address it will jump to start the DC program.
- **Waiting Ethernet** — If boot code earlier detected an Ethernet adapter, it places the message “WAITING FOR THE ETHERNET ADAPTER” on the LCD so the user will not think the printer has crashed.
- **Jump Back into Flash and Clear DRAM** — Boot code jumps back into flash memory, then clears the DRAM that held the boot code.

- **Jump to MTOS** — Jump to start initialization of the MTOS (Multi–Tasking Operating System).

DC Software Initialization and Power Up

The final part of the power up sequence is initialization and startup of the DC software, which occurs in the following order:

- **Clear Uninitialized RAM Variables**
- **Set Initialized RAM Variables**
- **Configure RAM (allocated based upon amount in the printer)**
- **Jump to MTOS (Multi-Tasking Operating System)**
- **Initialize the Processor (cache, vector table, etc.)**
- **Partition RAM for Tasks**
- **Allocate Peripheral Interfaces (console driver, etc.)**
- **Start Main Task (supervisor)**
- **Verify and Initialize NVRAM (statistics are cleared if NVRAM is not valid)**
- **Initialize Libraries (fault, system, emulation)**
- **Load Front Panel Menus from ROM**
- **Initialize these tasks, then start them after all have initialized:**

  Print Engine Driver Task

  CT Driver Task (sends 8344 code to the CT expansion board)

  Serial Driver Task

  Parallel Driver Task

  CT Emulation Task

  IGP Task (PGL or VGL)

  Base Emulation Task:
  Initialize Fonts
  Initialize Graphics Library
  Complete Emulation Library Initialization
  Wait for all emulation tasks to initialize

  Front Panel Task

- **Display “ONLINE” on control panel**

4 *Adjustment Procedures*

Introduction

The printer is a durable, low-maintenance machine, but some components and systems require occasional adjustment.

Usually, you will be referred to this chapter by a troubleshooting procedure, or as part of a removal/installation procedure.

Preparing the Printer for Maintenance

WARNING **Unplug the printer power cord from the printer or power outlet before you do any maintenance procedure. Failure to remove power could result in injury to you or damage to equipment. If you must apply power during maintenance, you will be instructed to do so in the maintenance procedure.**

IMPORTANT **Do not attempt field repairs of electronic components or assemblies. Do not de-solder any circuit board components. Replace a malfunctioning electronic assembly with an operational spare. Most electronic problems are corrected by replacing the printed circuit board assembly, sensor, or cable that causes the fault indication. The same is true of failures traced to the hammer bank: replace the entire shuttle frame assembly. It is not field repairable. Hammer spring assemblies are the only replaceable components of the shuttle frame assembly.**

To prepare the printer for maintenance, do the following steps before you make any adjustments:

1. Set the printer power switch to O (off).
2. Unplug the printer power cord from the printer or AC power source.
3. Disconnect the data (signal) cable from the printer interface.
4. Open the printer cover.
5. Unload paper.
6. Remove the ribbon.
7. Read the entire maintenance procedure before you begin working on the printer.
8. Gather the necessary parts before you begin working on the printer.

Returning the Printer to Normal Operation

When you are finished servicing the printer, do the following steps:

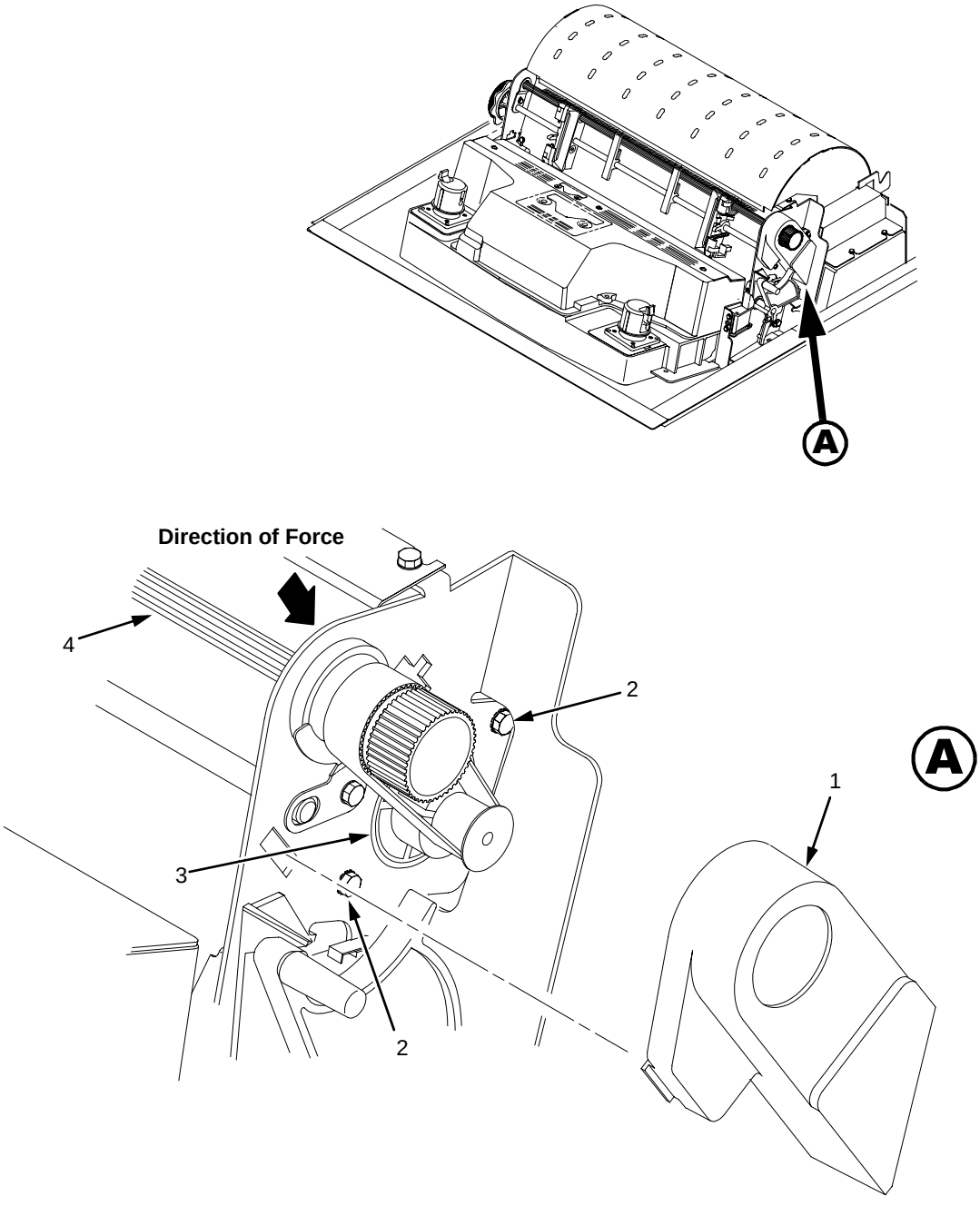
1. Install the ribbon.
2. Load paper.
3. Connect the data (signal) cable to the printer interface.
4. Plug the AC power cord into the printer and the power source.
5. Close the cabinet doors.
6. Set the printer power switch to | (on).
7. Test printer operation by selecting and running one of the operator print tests. (See page 89.)
8. Select the emulation. (Refer to the *User's Manual.)*
9. Set the top-of-form. (Refer to the *User's Manual.)*
10. Close the printer cover.

Belt, Paper Feed Timing, Adjustment (Figure 10)

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Cabinet Models: Loosen four screws and remove the barrier shield. (See page 214, items 3, 4 and 9.)
   Pedestal Models: Loosen the four screws securing the paper guide and barrier shield and remove both. (See page 216, items 3, 4, and 5.)
4. Remove the timing belt cover (1) by squeezing the front and back to release the plastic tabs from the slots in the side plate.
5. Loosen (do not remove) the two 5/16 inch motor mount bolts (2).
6. Using the straight end of a force gauge, apply 15 pounds (66.7 N) of pressure to the paper feed drive motor (3). Use the splined shaft (4) to steady the gauge.
7. Reduce tension to 12 pounds (53.4 N) and torque the 5/16 inch paper feed motor mount bolts (2) to 18 ± 2 inch-pounds (2.03 ± 0.23 N•m).

NOTE: Belt tension is correct if the belt deflects 1/8 inch midway between the pulleys.

8. Snap the timing belt cover (1) into the slots in the side plate.
9. Cabinet Models: Install the barrier shield and tighten the four screws. (See page 214, items 3, 4 and 9.)
   Pedestal Models: Install the barrier shield and paper guide and tighten the four screws. (See page 216, items 3, 4, and 5.)
10. Cabinet Models: Install the paper path (page 177).
    Pedestal Models: Install the top cover assembly (page 161).
11. Return the printer to normal operation (page 107).



Legend:

1) Timing Belt Shield
2) Motor Mount Bolt (2)
3) Paper Feed Drive Motor
4) Splined Shaft

Figure 10. Paper Feed Timing Belt Adjustment

Belt, Platen Open, Adjustment (Figure 11)

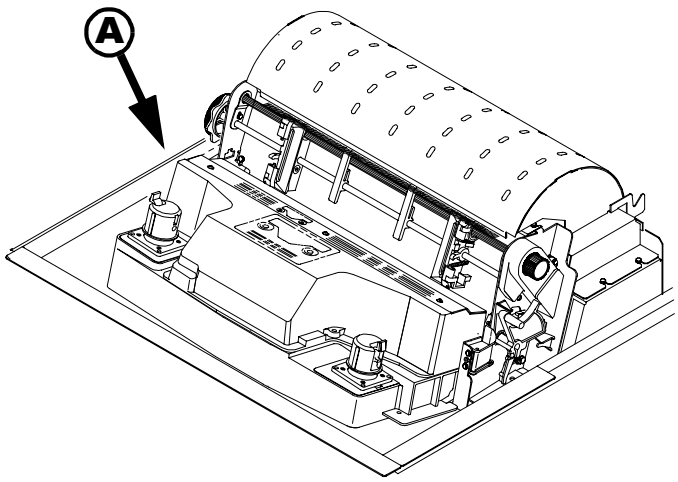
1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Remove the platen open belt cover (1) by squeezing the top and bottom to release the plastic tabs from the slots in the side plate.
4. Loosen the two 5/16 inch motor mount screws (2) enough to permit movement of the platen open motor. (Some motors are mounted with nuts and bolts; other motors have threaded flanges, eliminating the need for nuts.)
5. Close the forms thickness lever all the way.

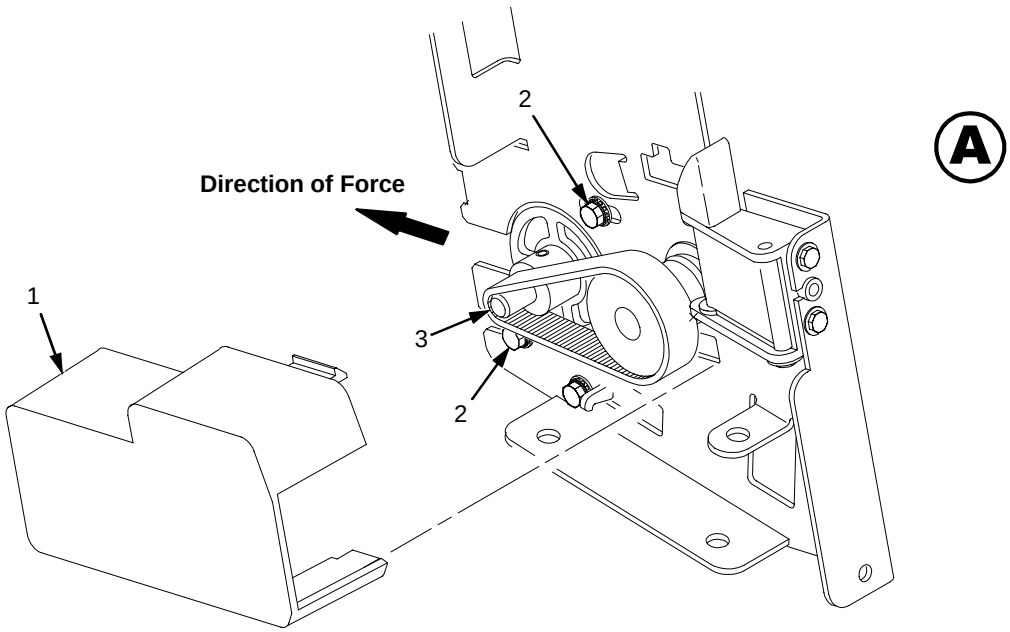
CAUTION **Too much tension on the platen open belt can cause the platen gap to change, which can lead to premature wear of the platen, damaged hammer tips, and poor print quality.**

6. Using a force gauge, apply 10 pounds (44.48 N) of tension to the shank of the platen drive pulley (3) by pushing in the direction away from the large platen pulley.
7. Reduce tension to 5 pounds (22.24 N) and torque the 5/16 inch motor mount screws (2) to 18 ± 2 inch-pounds (2.03 ± 0.23 N•m).

NOTE: Belt tension is correct if the belt deflects 1/8 inch midway between the pulleys.

8. Snap the platen open belt cover (1) into the slots in the side plate.
9. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).
10. Return the printer to normal operation (page 107).





Legend:

1) Belt Cover
2) Motor Mount Screw (2)
3) Platen Open Motor Shaft

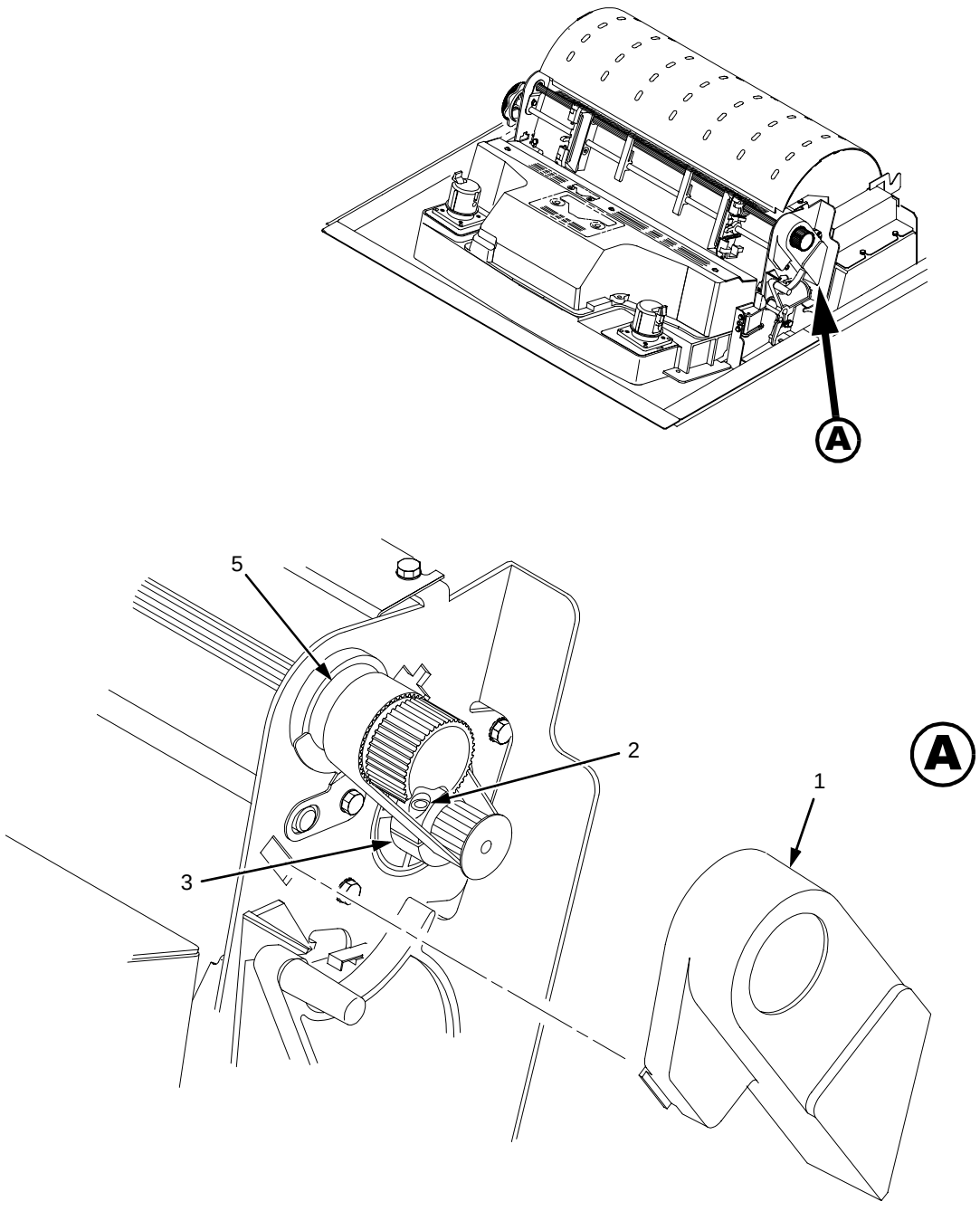
Figure 11. Platen Open Belt Adjustment

Paper Drive Motor Pulley Alignment (Figure 12)

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Remove the timing belt cover (1) by squeezing the front and back to release the plastic tabs from the slots in the side plate.
4. Loosen the 7/64 inch screw (2) in the motor pulley collar (3).
5. Align the paper drive motor pulley (4) with the splined shaft pulley (5).

CAUTION **Make sure there is at least 0.040 inches (1.016 mm) of clearance between the collar/pulley and the motor face plate.**

6. Hold the collar (3) flush against the motor pulley (4) and torque the 7/64 inch screw (2) to 25 ± 2 inch-pounds (2.82 ± 0.23 N•m).
7. Check for correct tension on the paper feed timing belt (page 108). Adjust if necessary.
8. Snap the timing belt cover (1) into the slots in the side plate.
9. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).
10. Return the printer to normal operation (page 107).



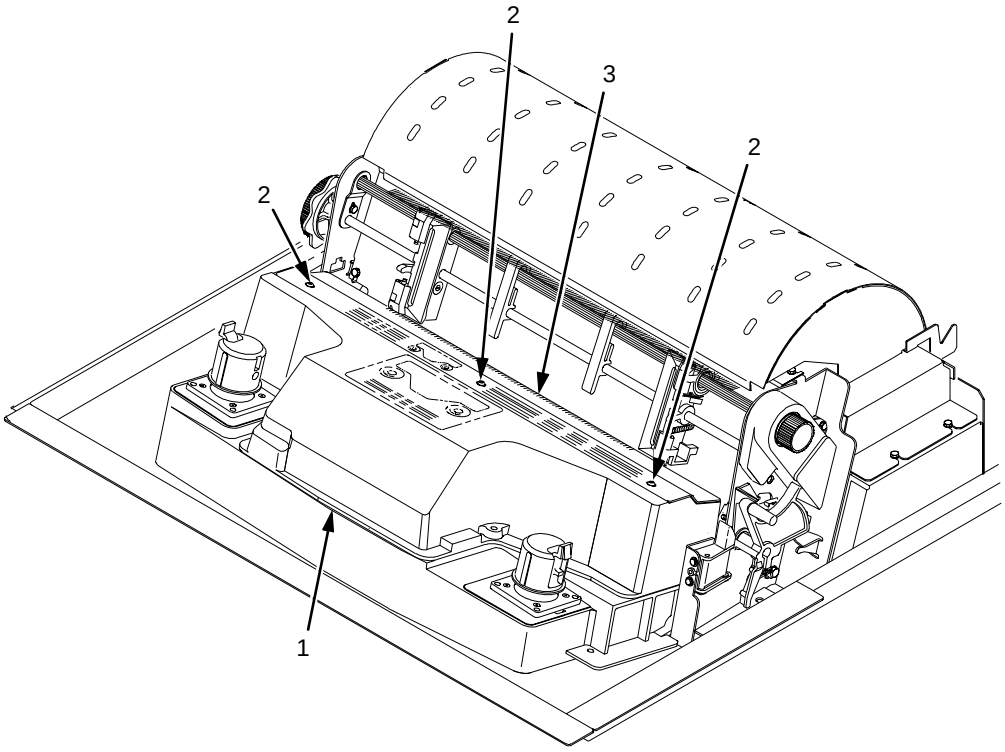
Legend:

1) Belt Shield
2) Cap Screw
3) Motor Pulley Collar
4) Motor Pulley
5) Splined Shaft Pulley

Figure 12. Paper Drive Motor Pulley Alignment

Paper Scale Alignment (Figure 13)

1. Open the printer cover.
2. Load paper and ribbon.
3. Connect the power cord to the AC power source.
4. Set the printer power switch to 1 (on).
5. Verify that the shuttle cover (1) is properly installed (page 160).
6. Print a full 136 column line by selecting and running one of the diagnostic self-tests. (See page 89.)
7. Check alignment of the scale to the print at column positions 1 and 136.
8. If adjustment is necessary, loosen the three 5/64 inch button-head hex screws (2).
9. Position the scale (3) so that column positions 1 and 136 line up with the first and last characters on the 136 character printout.
10. Tighten the 5/64 inch button-head hex screws (2).
11. Close the printer cover.



Legend:

1) Shuttle Cover
2) Screw, Button-Head, 5/64 inch hex (3)
3) Paper Scale

Figure 13. Paper Scale Alignment

Platen Gap Adjustment (Figure 14)

IMPORTANT **Only do this procedure if the original equipment shuttle frame assembly or platen has been replaced by a new or refurbished unit.**

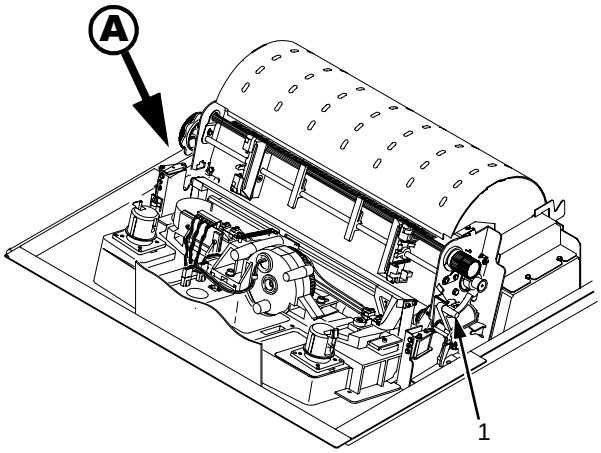
1. Prepare the printer for maintenance (page 106).
2. Remove the shuttle cover assembly (page 160).
3. Loosen the platen open belt (page 110, steps 2, 3, and 4).
4. Raise the forms thickness lever (1) to the fully open position.

CAUTION **Do not force the platen against the feeler gauge and do not move the feeler gauge laterally across the hammer bank. Damage to the hammer tips will result.**

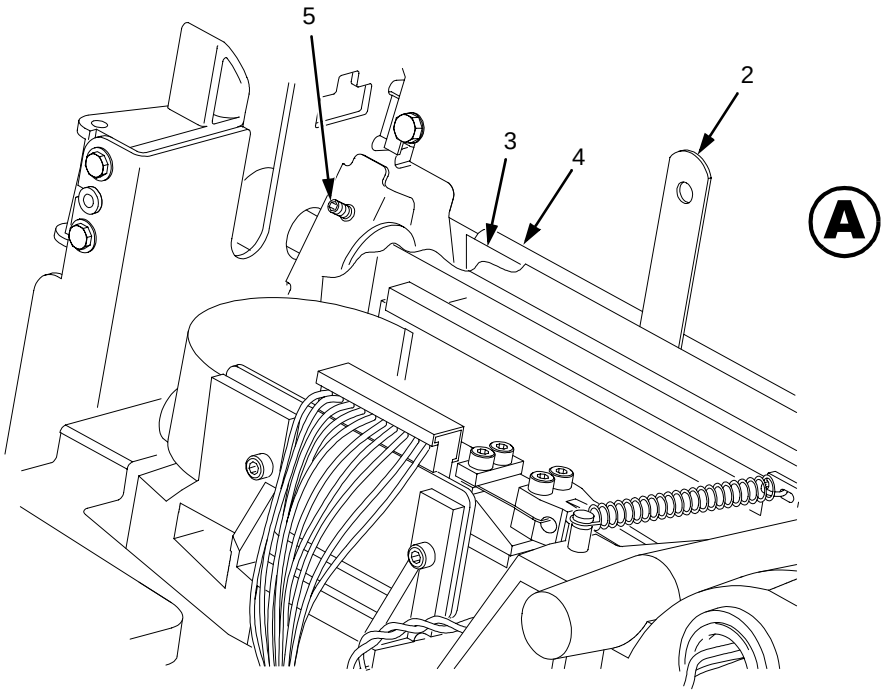
5. Insert a 0.011 inch (0.28 mm) flat feeler gauge (2) straight down between the hammer bank cover plate (3) and ribbon mask (4), within four hammer positions of the left end of the hammer bank.

CAUTION **Adjust the platen set screws less than 1/4 turn on one side, then check the other side. Adjustment sensitivity is approximately 0.03 inch per revolution of the set screw. Also, insert the feeler gauge no more than 2 inches down from the top of the ribbon mask.**

6. Gently close the forms thickness lever (1). As the platen is closing, gently slide the feeler gauge up and down, keeping it between the hammer tip and ribbon mask. If the feel is too tight when the platen is being closed, adjust the 3/32 inch set screw (5) at the end of the platen counterclockwise. If the feel is too loose, adjust the set screw clockwise. With the forms thickness lever closed all the way, the feeler gauge should contact both the tips and the ribbon mask and move with light friction. Shift the gauge slightly to verify.
7. Repeat steps 4 through 6 at the right end of the hammer bank.
8. After adjusting both sides, check the gap again at both ends. Readjust if necessary.
9. When the platen gap is correct at both ends of the platen, adjust the platen open belt (page 110).
10. Install the shuttle cover assembly (page 160).
11. Check the hammer phasing adjustment (page 128).
12. Return the printer to normal operation (page 107).



NOTE: Left side adjustment shown. Right side is the same.



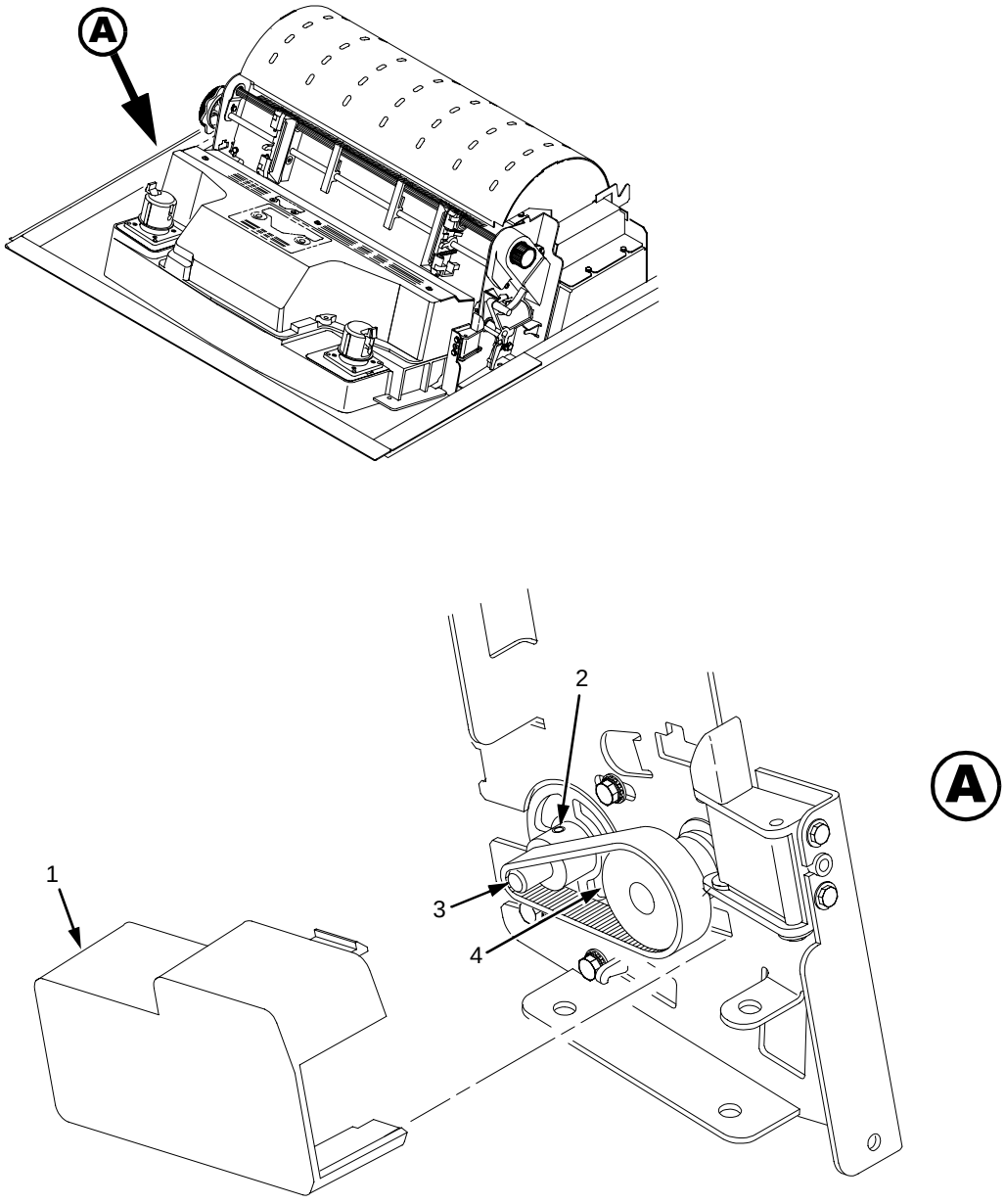
Legend:

1) Forms Thickness Lever
2) Feeler Gauge
3) Hammer Bank Cover
4) Ribbon Mask
5) Set Screw, 3/32 inch hex (2)

Figure 14. Platen Gap Adjustment

Platen Open Motor Pulley Alignment (Figure 15)

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Go to step 3.
   Pedestal Models: Remove the top cover assembly (page 161).
3. Remove the platen open belt cover (1) by squeezing the top and bottom to release the plastic tabs from the slots in the side plate.
4. Loosen the 1/16 inch set screw (2) in the motor pulley.
5. Bottom out the platen open motor pulley (3) on the motor shaft and torque the 1/16 inch set screw (2) to 11 ± 2 inch-pounds (1.24 ± 0.23 N•m).
6. Check the platen open belt tension (page 110). Adjust if necessary.
7. Snap the platen open belt cover (1) into the slots in the side plate.
8. Cabinet Models: Go to step 9.
   Pedestal Models: Install the top cover assembly (page 161).
9. Return the printer to normal operation (page 107).



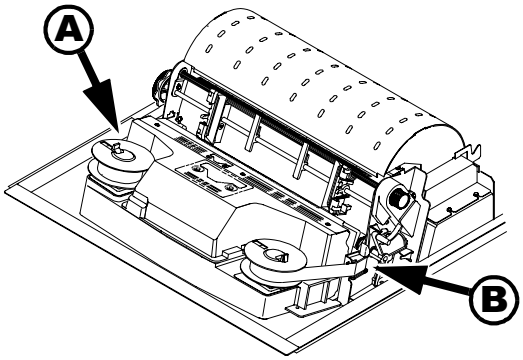
Legend:

1) Belt Cover
2) Set Screw
3) Platen Open Motor Pulley
4) Platen Shaft Pulley

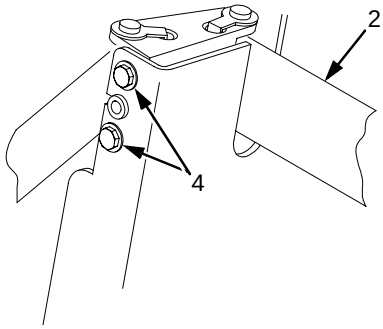
Figure 15. Platen Open Motor Pulley Alignment

Ribbon Guide Alignment (Figure 16)

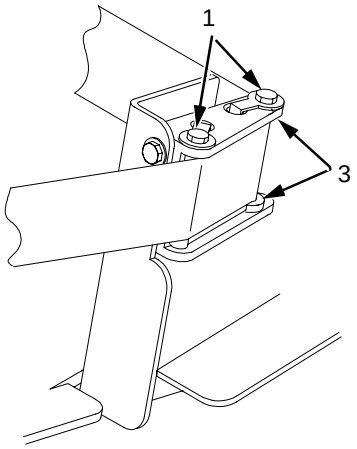
1. Open the printer cover.
2. Load paper and install the ribbon. To align a ribbon guide, wind the ribbon fully onto the ribbon spool on the opposite side. For example, to align the left ribbon guide, wind the ribbon until the right ribbon spool is full.
3. Check ribbon tracking by running a ribbon and shuttle diagnostic self-test. (See Chapter 3.)
4. On the ribbon guide to be adjusted, momentarily short between the ribbon guide skid screws (1) to verify that the ribbon reverses.
5. Observe how the ribbon (2) passes around and across the ribbon guide. It should be centered and not folding against either of the two white nylon washers (3).
6. If the ribbon is not centered, loosen the retaining screws (4) just enough so that you can rotate the ribbon guide to new positions, but it remains in place once moved.
7. Rotate the ribbon guide as required to center the ribbon (2).
8. Observe how the ribbon (2) winds onto the ribbon spool of the side you adjusted. If the ribbon is interfering with the flange of the spool, make sure the ribbon hub and spool are mounted correctly.
9. Tighten the retaining screws (4).
10. Allow most of the ribbon to wind onto the ribbon spool on the side you adjusted, then repeat steps 3 through 9 for the other ribbon guide.

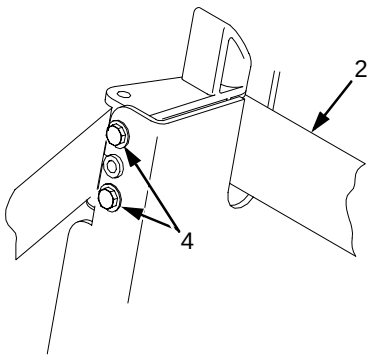


A **Left Ribbon Guide** **Right Ribbon Guide** **B**

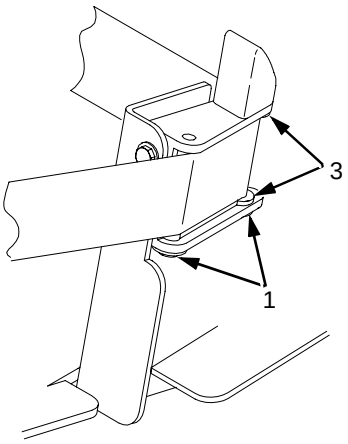


Early Models





Later Models



Legend:

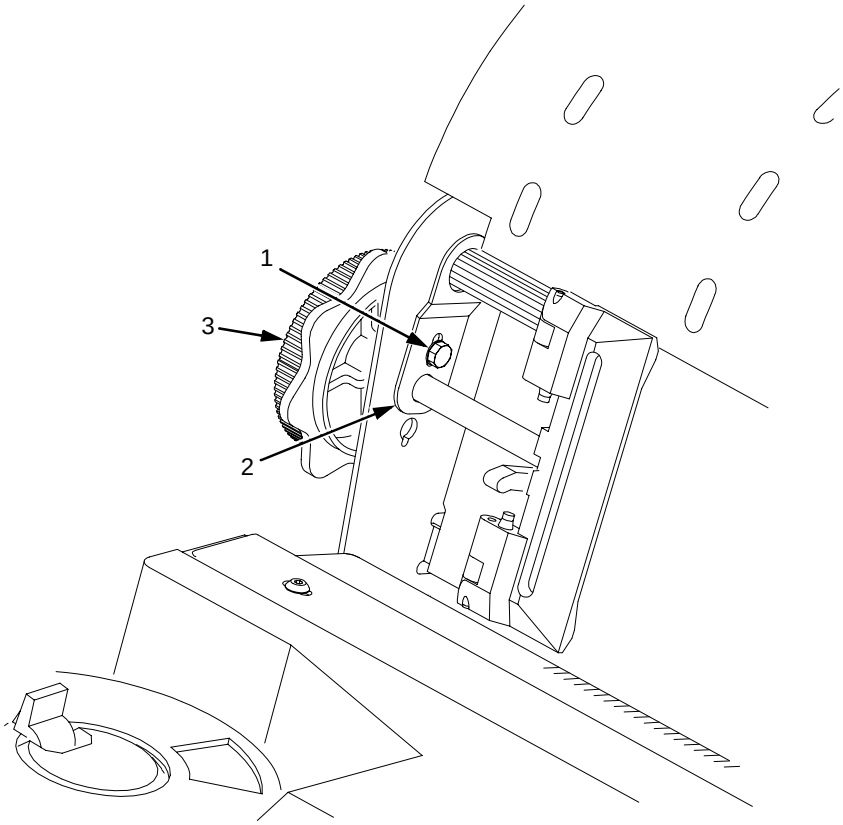
1) Screw, Skid (2)
2) Ribbon
3) White Nylon Washer
4) Screw, Retaining (2)

Figure 16. Ribbon Guide Alignment

Splined Shaft Skew Adjustment (Figure 17)

If lines of print are not parallel with the perforations on the paper, perform the following adjustment.

1. Open the printer cover.
2. Loosen the screw (1) securing the adjusting link (2).
3. Adjust the link (2) by raising or lowering the horizontal adjustment knob (3) to obtain print parallel with paper perforations. Tighten the screw (1).
4. Return the printer to normal operation (page 107).



Legend:

1) Screw
2) Adjusting Link
3) Horizontal Adjustment Knob

Figure 17. Splined Shaft Skew Adjustment

Paper Out Adjustment

This procedure tests and sets the distance from the page perforation at which a LOAD PAPER fault message is triggered. This adjustment prevents printing on the platen when the printer runs out of paper. The measurement units are dot rows.

You will use the dot row patterns printed by the Paper Out Adjustment test to verify that this parameter is set correctly.

NOTE: Do this procedure only if a new paper detector switch assembly has been installed, the CMX controller board has been replaced, or if you are sure the paper out adjustment is incorrect. A paper out triggering distance of 1 or 2 dot rows above the perforation is acceptable; 5 to 7 dot rows above or any dot rows below indicates adjustment is required. Also, although it is not required, it is advisable to test the paper out triggering distance with 6-part paper, in order to verify correct printing with multi-part forms.

The procedure below describes how to run the Paper Out Adjustment test and modify the paper out “Dots” value.

1. Open the printer cover.
2. On cabinet models, open the cabinet front door.
3. Load paper. Make sure the forms thickness lever is closed.
4. Power on the printer.
5. On the sheet of paper just below the paper entrance slot, tear a four inch square on the left side, immediately below the perforation. (See Figure 18.) This creates a hole that will trigger a LOAD PAPER fault message, but allows printing to the right of the hole (which would normally be on the platen).
6. If the printer is on-line, press the **ON LINE** key to place the printer off-line.

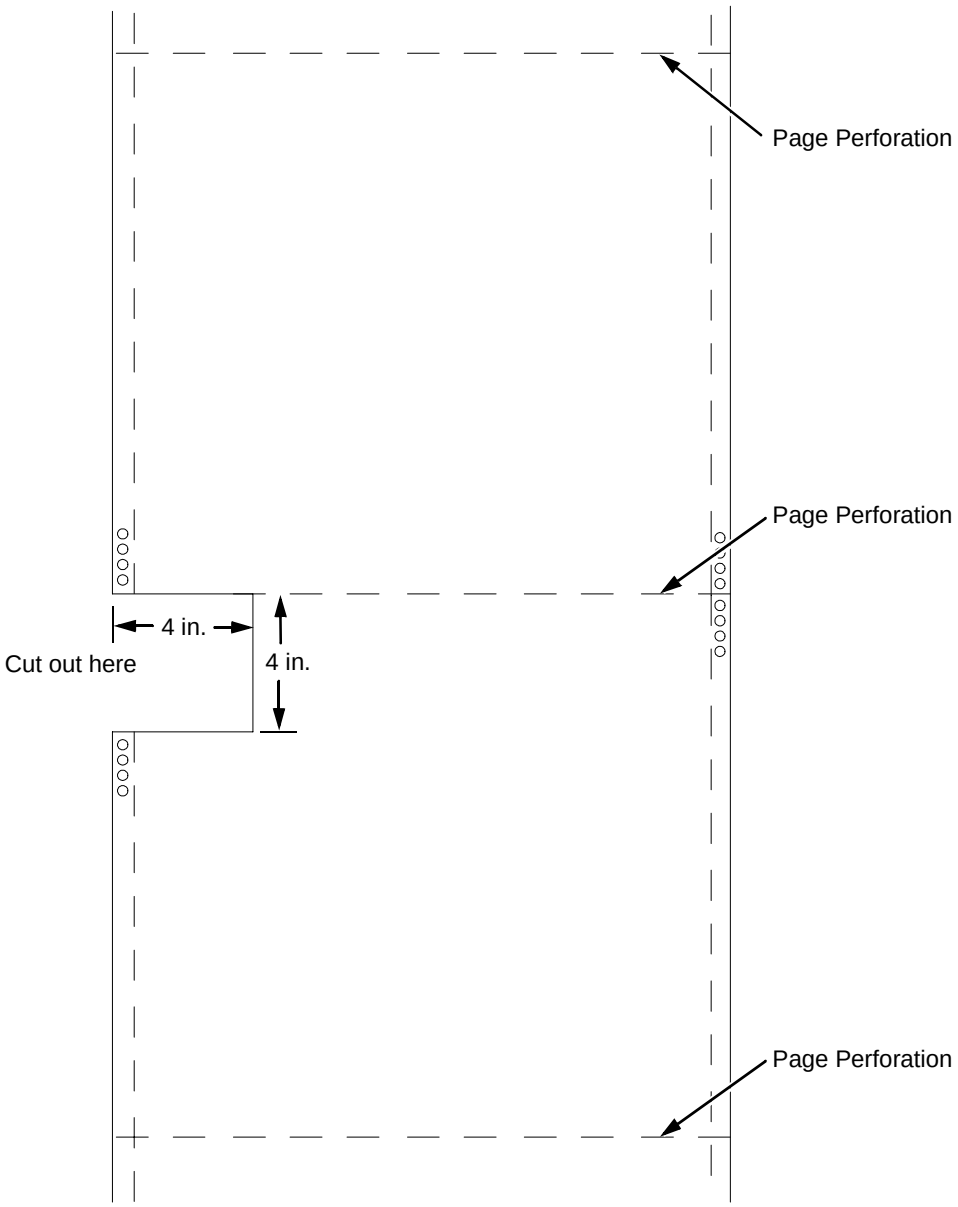
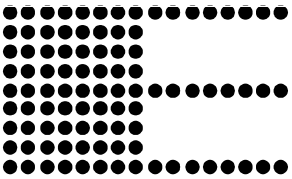


Figure 18. Paper Preparation for Paper Out Adjustment Test

7. On the control panel, press the ▲ + ▼ keys to unlock the **ENTER** key. “ENTER SWITCH UNLOCKED” briefly displays. (If “LOCKED” displays, simply press ▲ and ▼ again. This is the default key combination. The lock/unlock key combination can be programmed by the user. If ▲ + ▼ does not unlock **ENTER**, get the combination from the user.)
8. Press the ◀ key. “DIAGNOSTICS” displays.
9. Press ▼. “DIAGNOSTICS / Printer Tests” displays.
10. Press ▼. “SHIFT / RECYCLE” displays.
11. Press ▶ until “Paper Out Adjustment” displays.

    This test will print a vertical “comb” pattern at around column 70, each long bar separated by three shorter bars. An enlarged example of the comb pattern is shown below.



12. Press **ENTER** until the Paper Out Adjustment test starts. The comb pattern will print until the display shows “LOAD PAPER” and the audible alarm sounds.
13. Open the platen and move the paper up with the vertical position knob and examine the area of the page perforation.

    If a long bar just meets the perforation, the paper out adjustment distance is correct, skip to step 26. (1 or 2 dot rows above the perforation is OK; 5 to 7 dot rows above or any dots below the perforation mean adjustment of the Paper Out Dots value is required.)

    If the comb pattern stopped short of the perforation or printed beyond the perforation, go to step 14.
14. Measure how short or long the comb pattern printed by counting the number of dot rows needed to reach the perforation, or the number of dot rows that printed beyond the perforation.

NOTE: You can use the long bars to count the dot rows quickly. There are three dot rows between each long bar, so each long bar increases the number of dot rows by four. You can also tear off a small piece of the comb pattern from the beginning of the pattern and use it as a ruler to help you measure the dot rows required either to reach the perforation or back up to it.

15. Close the platen.
16. Press **CLEAR** to remove the fault condition.
    “OFFLINE / CONFIG. CONTROL” displays.
17. Press the ◀ key. “DIAGNOSTICS” displays.
18. Press ▼. “DIAGNOSTICS / Printer Tests” displays.
19. Press ▶ until “Paper Out Dots” displays.
20. Press ▼. The top line of the display will show “Paper Out Dots” and the bottom line will show the current setting for the number of dots.

21. Press ▼. The number of dots will move up to the top line of the display with an asterisk (*) next to it.
22. Using the ▶ or ◀ key, adjust the XX DOTS value up or down by the number of dots you counted in step 14. (If the comb pattern stopped short of the perforation, increase the number of dots. If the comb pattern printed beyond the perforation, decrease the number of dots.)
23. Press **ENTER** to select the new number of dots as the active value. (The asterisk that appears tells you that it is now the active value.)
24. Press **CLEAR** to place the printer off-line.
    "OFFLINE / CONFIG. CONTROL" displays.
25. Run the Paper Out Dots and the Paper Out Adjustment tests until the comb pattern prints at an acceptable distance from the page perforation. (Return to step 9.)
26. When the paper out triggering distance is acceptable, reload the paper, feed it past any remaining unused holes that you tore in it, and set the top of form.
27. Press ▲ **+** ▼ (or the key combination set by the user). "ENTER SWITCH LOCKED" briefly displays.
28. Close the printer cover.
29. Press the **ON LINE** key to place the printer on-line.

Hammer Phasing Adjustment

You must check and adjust hammer phasing if the CMX controller board is replaced, the shuttle frame assembly is removed, or if the MPU is replaced.

The hammer phase value is a timing parameter that permits you to adjust the vertical alignment of dots in character printing. The phase value numerical units are relative; they do not represent a physical measurement or value. Thus there is no “correct” value or range. But, if the phasing value is far enough from the theoretical ideal value on a particular printer, errors can occur. If, for example, you are adjusting phasing and an error such as PAP FIFO UNDRFL* occurs, the phase value may be too high. Try a lower value.

The factory prints the initial phase value on the aluminum casting of the shuttle assembly, next to the motor housing. Adjust the phasing to this value and recheck the vertical alignment. When vertical alignment is acceptable, write the new phasing value on the shuttle.

Phasing should be adjusted with the printer printing at full paper width.

IMPORTANT **The printer must be printing the Phase pattern of “H’s” when the Phasing Value is changed, or the New Phasing Value will not be written into NVRAM. If the value is changed when not printing, the printer will return to its default phasing value when powered off then back on.**

1. Raise the printer cover.
2. Install the ribbon.
3. Load full width (136 column) paper and set the top of form.
4. Power on the printer.
5. If the printer is on-line, press the **ON LINE** key to place the printer off-line. “OFFLINE / CONFIG. CONTROL.” displays.
6. On the control panel, press the ▲ + ▼ keys to unlock the **ENTER** key. “ENTER SWITCH UNLOCKED” briefly displays. (If “LOCKED” displays, simply press ▲ and ▼ again. This is the default key combination. The lock/unlock key combination can be programmed by the user. If ▲ + ▼ does not unlock **ENTER**, get the combination from the user.)
7. Press the ◀ key. “OFFLINE / DIAGNOSTICS” displays.
8. Press ▼. “DIAGNOSTICS / Printer Tests” displays.
9. Press ▼. “Printer Tests / Shift Recycle” displays.
10. Press ◀ until “Printer Tests / Phase Printer” displays.
11. Press **ENTER**. The display shows “Printer Tests / Phase Printer” and the test begins. The current phasing value is printed on the left of the printed pattern of all H’s. As the pattern prints, compare the H’s to the figure below. If the phasing needs adjustment, go to step 12. If the phasing is OK, go to step 15.

Needs Adjustment | **Correct** | Needs Adjustment

12. Press ▼: The current phase index displays. Press ▼ again: An asterisk (*) appears next to the phase value.
13. Press ▶ to increase or ◀ to decrease the phasing index value, then press **ENTER** to activate the value as it prints. Continue to increase or decrease the phasing index until the pattern of H's is acceptable.
14. Press ▲ twice: "Printer Tests / Phase Printer" displays.
15. Press **ENTER** to stop the test.
16. Press **CLEAR**. "OFFLINE / CONFIG. CONTROL" displays.
17. Press ▲ **+** ▼ (or the key combination set by the user). "ENTER SWITCH LOCKED" briefly displays.
18. Close the printer cover.
19. Press the **ON LINE** key to place the printer on-line.

NOTE: If you changed the phasing value, power down the printer, remove the shuttle cover, and write the new phase value on the aluminum shuttle casting.

Loading Flash Memory from One Diskette

Flash memory is contained in SIMMs (single in-line memory modules) located on the controller board. Printer emulation and operating system software are loaded into flash memory at the factory, but you will install software in some situations:

- The customer buys the PGL or VGL graphics, Expansion-CT, or IPDS option after the printer is installed
- The customer needs to upgrade printer software
- The customer needs different emulation software
- You have replaced the controller board
- You have added or replaced the flash memory SIMM

Emulation and operating system software are stored as a compressed file on a 3.5 inch floppy diskette. This file is “executable.” You will expand it and copy it into printer flash memory.

You can load software through either the serial or parallel port of the printer. The load commands are different, depending on the printer port you use. These differences are explained in the note following step 18.

1. Make a printout of *all* saved configurations. (Refer to the *User’s Manual*.) (Installing new software erases all saved configurations. You will use the printouts to restore printer configuration.)
2. Set the printer power switch to O (off).
3. If the printer is already connected to the serial or parallel port of a computer capable of running an MS-DOS® based PKZIP® self-extracting file, go to step 10. If not, go to step 4.
4. Unplug the AC power cord from the printer.
5. Disconnect all data input cables from the printer interface. If the printer has an internal Ethernet interface card, do the following:
   a. Cabinet models: remove the paper path (page 177).
      Pedestal models: remove the top cover assembly (page 161).
   b. Unplug the Centronics I/O cable from the Ethernet interface card.
   c. Secure the loose end of the Centronics I/O cable to prevent the connector from contacting any other exposed components.
   d. Attach the parallel cable connector from the computer to the Centronics I/O connector.
6. Connect a parallel data cable to the LPT1 port or a serial data cable to the COM1 port of an IBM-compatible computer that is using the PC-DOS™ or MS-DOS operating system.

NOTE: You can connect the cable to the LPT2 port if the LPT1 port is already in use. The load commands are different if you use this port, as described in the note after step 18.

7. Connect the data cable to the appropriate I/O port of the printer.
8. Plug the AC power cord into the printer.

9. Power on the computer.
10. Insert the emulation or upgrade diskette into diskette drive A (or B) of the computer.
11. Make the diskette drive the active drive by typing the following at the DOS prompt:

    A:<return> (If the diskette is in drive B, type **B:**<return>)
12. Get the name of the compressed file on the diskette by listing the contents of the diskette; at the DOS prompt type:

    DIR<return>
    The compressed file on the diskette takes the form FILENAME.EXE
    Now write down the complete name of the file with the .EXE extension.
13. On the printer control panel, press and hold down the **ON LINE + PAPER ADVANCE** keys. Without releasing the keys, power the printer on. Continue holding the **ON LINE** and **PAPER ADVANCE** keys down.
14. When you see "WAITING FOR PROGRAM DOWNLOAD" on the LCD, release the **ON LINE** and **PAPER ADVANCE keys.**

NOTE: The port default is CENTRONICS; this is the standard load through the parallel port. If you want to use the default, continue at step 18.

15. Press the ▸ **(NEXT)** key; "SELECT DOWNLOAD PORT=DATAPRODUCT" appears on the LCD.
16. Press ▸ **(NEXT)** again to cycle through the download ports available in the printer:

    DATAPRODUCT (parallel)
    CENTRONICS* (parallel) (default port)
    RS232-9600 (RS-232 serial, 9600 baud)
    RS232-19.2K (RS-232 serial, 19200 baud)
    RS232-38.4K (RS-232 serial, 38400 baud)
    RS232-115K (RS-232 serial, 115000 baud)
    RS422-9600 (RS-422 serial, 9600 baud)
    RS422-19.2 (RS-422 serial, 19200 baud)
    RS422-38.4K (RS-422 serial, 38400 baud)
    RS422-115K (RS-422 serial, 115000 baud)
17. When the printer download port you want to use is displayed on the LCD, press **ENTER.** "WAITING DOWNLOAD / PORT = <*your selection*> appears on the display.
18. At the DOS prompt on the computer type:

    FILENAME.EXE -pb<return>
    where FILENAME.EXE is the compressed file you noted in step 12. This command decompresses the file on the diskette and copies it as a binary file into the flash memory on the printer controller board.

NOTE: If you are loading the file using the LPT2 port on the computer, enter the following DOS command:
FILENAME.EXE -pb 2 <Return>

The 9600 baud rate is the only selection older versions of DOS can use. The baud rate information entered in the following DOS

commands must match the selection you made in step 16.

If you are loading the file through the printer serial port, enter the following DOS commands:
MODE COM1:9600,N,8,1,P<Return>
FILENAME.EXE -pbc1<Return>

19. While the file is copied into memory, the printer LCD informs you of the load process and status. (See Table 5: below.)
20. When the new program has successfully loaded into memory and the printer has reset itself, set the printer power switch to O (off).
21. Unplug the AC power cord from the printer.
22. Remove the diskette from the computer and store it with the printer.
23. Power off the computer.
24. If you had to install a data cable to the computer and printer in step 6, disconnect it from the computer and printer.
25. Reconnect the customer's data input cable(s) to the printer, if required.
26. Return the printer to normal operation (page 107).
27. Using the configuration printout(s) you made in step 1, reconfigure the printer. (Refer to the *User's Manual*.)

Table 5: Flash Memory Message Guide

Message	Explanation	Required Action
CLEARING PROGRAM FROM FLASH	The program successfully loaded into printer RAM and the checksum matched. The old program is now being deleted from flash memory.	None
DIAGNOSTIC PASSED	The printer passed its memory and hardware initialization tests.	None
ERROR: DC PROGRAM NOT VALID	Printer cannot find the data controller program or the validation checksum is corrupted.	Download the program again: Power off the printer and start over at step 13. If the message occurs again, replace the flash memory.
ERROR: DRAM AT ADDRESS XXXXXXXX	The printer found a defective memory location.	Replace the DRAM.
ERROR: EC PROGRAM NOT VALID	Printer cannot find the engine controller program or the validation checksum is corrupt.	Download the program again: Power off the printer and start over at step 13. If the message occurs again, replace the flash memory.
ERROR: EC STOPPED AT STATE XXXX	Hardware fault in the engine controller.	See page 53.

Table 5: Flash Memory Message Guide

Message	Explanation	Required Action
ERROR: FLASH DID NOT PROGRAM	The printer encountered an error trying to program flash memory.	Download the program again: Power off the printer and start over at step 13. If the message occurs again, replace the flash memory.
ERROR: FLASH NOT DETECTED	The printer could not find any flash memory.	Install flash memory before trying to download this program, or reseat the SIMMs if they are present.
ERROR: NO DRAM DETECTED	The printer could not find any DRAM.	Check DRAM on CMX. If present, reseat DRAM, If missing, install DRAM.
ERROR: NVRAM FAILURE	The non-volatile memory has failed.	Replace the CMX controller board. (Do NOT attempt to replace NVRAM.)
ERROR: PROGRAM NEEDS MORE DRAM	The printer requires more DRAM memory in order to run the downloaded program.	Add DRAM or use a smaller emulation program.
ERROR: PROGRAM NEEDS MORE FLASH	The printer requires more flash memory in order to run the downloaded program.	Add flash memory or use a smaller emulation program.
ERROR: PROGRAM NOT COMPATIBLE	The printer is not compatible with the downloaded program.	Use the correct emulation software option(s) for this model.
ERROR: PROGRAM NOT VALID	The printer does not see a program in flash memory.	There is no program in printer memory. Go to step 1.
ERROR: SECURITY PAL NOT DETECTED	The security PAL is not present or has failed.	Check the security PAL at location U54 on the CMX controller. If the PAL is absent, install correct PAL. If security PAL is present, replace the CMX controller board.
ERROR: SHORT AT ADDRESS XXXX	Hardware failure in DRAM or CMX controller circuitry.	Replace DRAM. If message occurs with new DRAM, replace CMX controller board.
ERROR: WRITING TO FLASH	Hardware or software fault in flash memory.	Download the program again: Power off the printer and start over at step 13. If the message occurs again, replace the flash memory.

Table 5: Flash Memory Message Guide

Message	Explanation	Required Action
ERROR: WRONG CHECKSUM	The printer received the complete program but the checksum did not match. The data were corrupted during download.	Download the program again: Power off the printer and start over at step 13.
ERROR OCCURRED FLUSHING QUEUES *	An interim message that displays while the printer discards host data it cannot use because a fault condition exists. While this message displays, the asterisk (*) rotates.	Wait. When the asterisk (*) stops rotating, a different fault message will appear: troubleshoot the final message.
LOADING PROGRAM FROM PORT XX%	The new program is loading into printer RAM. XX indicates how much of the program has loaded.	None
LOADING PROGRAM INTO FLASH	The printer has deleted the previous program from flash memory and is loading the new program into flash memory.	None
PLEASE WAIT... RESET IN PROGRESS	The printer finished loading the program into flash memory and is automatically resetting itself.	None
RESTORING BOOT CODE	Normal download initialization message.	None
SECURITY CODE VIOLATION	The software running or being downloaded does not match the security PAL code.	Install the correct PAL or program. (PAL and program must match.)
SENDING PROGRAM TO EC PROCESSOR	The printer is loading the engine controller program into the engine controller.	None
TABLE MISMATCH DOWNLOAD AGAIN	EC software update in process.	Download the program again: Power off the printer and start over at step 13.

Loading Flash Memory from Multiple Diskettes

Flash memory is contained in SIMMs (single in-line memory modules) located on the controller board. Printer emulation and operating system software are loaded into flash memory at the factory, but you will install software in some situations:

- The customer buys the PGL or VGL graphics, Expansion-CT, or IPDS option after the printer is installed
- The customer needs to upgrade printer software
- The customer needs different emulation software
- You have replaced the controller board
- You have added or replaced the flash memory SIMM

Emulation and operating system software are stored as compressed files on more than one 3.5 inch floppy diskette. You will recombine the multiple files from the diskettes into one file on your computer's hard disk in order to download the file to the printer. To assist in this process, the MS-DOS® based program PKUNZIP® is included on the last diskette with the program file.

You can load software through either the serial or parallel port of the printer. The load commands are different, depending on the printer port you use. These differences are explained in the note following step 26.

1. Make a printout of *all* saved configurations. (Refer to the *User's Manual*.) (Installing new software erases all saved configurations. You will use the printouts to restore printer configuration.)
2. Set the printer power switch to O (off).
3. If the printer is already connected to the serial or parallel port of a computer capable of running an MS-DOS based PKZIP self-extracting file, go to step 10. If not, go to step 4.
4. Unplug the AC power cord from the printer.
5. Disconnect all data input cables from the printer interface. If the printer has an internal Ethernet interface card, do the following:
    a. Cabinet models: remove the paper path (page 177).
    Pedestal models: remove the top cover assembly (page 161).
    b. Unplug the Centronics I/O cable from the Ethernet interface card.
    c. Secure the loose end of the Centronics I/O cable to prevent the connector from contacting any other exposed components.
    d. Attach the parallel cable connector from the computer to the Centronics I/O connector.
6. Connect a parallel data cable to the LPT1 port or a serial data cable to the COM1 port of an IBM-compatible computer that is using the PC-DOS™ or MS-DOS operating system.

NOTE: You can connect the cable to the LPT2 port if the LPT1 port is already in use. The load commands are different if you use this port, as described in the note after step 26.

7. Connect the data cable to the appropriate I/O port of the printer.
8. Plug the AC power cord into the printer.
9. Power on the computer.
10. Create a directory on your computer hard drive where you will store the recombined files from the emulation diskettes by typing the following at the DOS prompt:

    MD DOWNLOAD<return>
11. Make the newly created directory the “active” directory by typing the following at the DOS prompt:

    CD DOWNLOAD<return>
12. Insert the last diskette in the series (e.g., 2 of 2, 3 of 3, etc.) into diskette drive A (or B) of the computer.
13. Get the name of the compressed file on the diskette by typing the following at the DOS prompt:

    DIR A:<return> (If the diskette is in drive B, type DIR B:<return>)
    The compressed file on the diskette takes the form *FILENAME.ZIP*, where the filename is a six digit number (e.g., 123456.zip).
14. At the DOS prompt type:

    A:\PKUNZIP A:*FILENAME* (Replace A: with B: if you are using the B dirve), where *FILENAME* is the six digit number you noted in the previous step.
15. The PKUNZIP program will execute, and the following message will appear on the computer screen:

    Insert disk #1 - Press a key when ready
16. Remove the diskette in the disk drive and insert the diskette labeled

    Disk 1 of 2 (or 1 of 3, etc.)
17. Press the <return> key. After the file is decompressed to the hard drive, the following message will appear on the computer screen:

    Insert disk #2 - Press a key when ready
18. Remove the diskette in the disk drive and insert the diskette labeled

    Disk 2 of 2 (or 2 of 3, etc.)
19. Press the <return> key. If there are only two diskettes for the emulation, you will be returned to the DOS prompt when the decompression is complete. If there are three diskettes, you will be asked to insert disk #3 and press a key.
20. When all diskettes have been decompressed, type the following at the DOS prompt:

    DIR<return>
    You will see a directory listing containing the file ***FILENAME.EXE***, where the filename is the six digit number (e.g., 123456.exe) you noted above. **This is the file you will download into the printer.**

21. On the printer control panel, press and hold down the **ON LINE + PAPER ADVANCE** keys. Without releasing the keys, power the printer on. Continue holding the **ON LINE** and **PAPER ADVANCE** keys down.
22. When you see “WAITING FOR PROGRAM DOWNLOAD” on the LCD, release the **ON LINE** and **PAPER ADVANCE keys.**

NOTE: The port default is CENTRONICS; this is the standard load through the parallel port. If you want to use the default, continue at step 18.

23. Press the ▸ **(NEXT)** key; “SELECT DOWNLOAD PORT=DATAPRODUCT” appears on the LCD.
24. Press ▸ **(NEXT)** again to cycle through the download ports available in the printer:

    DATAPRODUCT (parallel)
    CENTRONICS* (parallel) (default port)
    RS232-9600 (RS-232 serial, 9600 baud)
    RS232-19.2K (RS-232 serial, 19200 baud)
    RS232-38.4K (RS-232 serial, 38400 baud)
    RS232-115K (RS-232 serial, 115000 baud)
    RS422-9600 (RS-422 serial, 9600 baud)
    RS422-19.2 (RS-422 serial, 19200 baud)
    RS422-38.4K (RS-422 serial, 38400 baud)
    RS422-115K (RS-422 serial, 115000 baud)
25. When the printer download port you want to use is displayed on the LCD, press **ENTER.** “WAITING DOWNLOAD / PORT = <*your selection*> appears on the display.
26. At the DOS prompt on the computer type:

    FILENAME.EXE -pb<return>
    where FILENAME.EXE is the compressed file you noted in step 20. This command decompresses the file on the hard drive and copies it as a binary file into the flash memory on the printer controller board.

NOTE: If you are loading the file using the LPT2 port on the computer, enter the following DOS command:
FILENAME.EXE -pb 2 <Return>

The 9600 baud rate is the only selection older versions of DOS can use. The baud rate information entered in the following DOS commands must match the selection you made in step 25.

If you are loading the file through the printer serial port, enter the following DOS commands:
MODE COM1:9600,N,8,1,P<Return>
FILENAME.EXE -pbc1<Return>

27. While the file is copied into memory, the printer LCD informs you of the load process and status. (See Table 6: below.)
28. When the new program has successfully loaded into memory and the printer has reset itself, set the printer power switch to O (off).
29. Unplug the AC power cord from the printer.
30. Remove the diskette from the computer and store it with the printer.

31. Power off the computer.
32. If you had to install a data cable to the computer and printer in step 6, disconnect it from the computer and printer.
33. Reconnect the customer's data input cable(s) to the printer, if required.
34. Return the printer to normal operation (page 107).
35. Using the configuration printout(s) you made in step 1, reconfigure the printer. (Refer to the *User's Manual*.)

Table 6: Flash Memory Message Guide

Message	Explanation	Required Action
CLEARING PROGRAM FROM FLASH	The program successfully loaded into printer RAM and the checksum matched. The old program is now being deleted from flash memory.	None
DIAGNOSTIC PASSED	The printer passed its memory and hardware initialization tests.	None
ERROR: DC PROGRAM NOT VALID	Printer cannot find the data controller program or the validation checksum is corrupted.	Download the program again: Power off the printer and start over at step 21. If the message occurs again, replace the flash memory.
ERROR: DRAM AT ADDRESS XXXXXXXX	The printer found a defective memory location.	Replace the DRAM.
ERROR: EC PROGRAM NOT VALID	Printer cannot find the engine controller program or the validation checksum is corrupt.	Download the program again: Power off the printer and start over at step 21. If the message occurs again, replace the flash memory.
ERROR: EC STOPPED AT STATE XXXX	Hardware fault in the engine controller.	See page 53.
ERROR: FLASH DID NOT PROGRAM	The printer encountered an error trying to program flash memory.	Download the program again: Power off the printer and start over at step 21. If the message occurs again, replace the flash memory.
ERROR: FLASH NOT DETECTED	The printer could not find any flash memory.	Install flash memory before trying to download this program, or reseat the SIMMs if they are present.
ERROR: NO DRAM DETECTED	The printer could not find any DRAM.	Check DRAM on CMX. If present, reseat DRAM, If missing, install DRAM.

Table 6: Flash Memory Message Guide

Message	Explanation	Required Action
ERROR: NVRAM FAILURE	The non-volatile memory has failed.	Replace the CMX controller board. (Do NOT attempt to replace NVRAM.)
ERROR: PROGRAM NEEDS MORE DRAM	The printer requires more DRAM memory in order to run the downloaded program.	Add DRAM or use a smaller emulation program.
ERROR: PROGRAM NEEDS MORE FLASH	The printer requires more flash memory in order to run the downloaded program.	Add flash memory or use a smaller emulation program.
ERROR: PROGRAM NOT COMPATIBLE	The printer is not compatible with the downloaded program.	Use the correct emulation software option(s) for this model.
ERROR: PROGRAM NOT VALID	The printer does not see a program in flash memory.	There is no program in printer memory. Go to step 1.
ERROR: SECURITY PAL NOT DETECTED	The security PAL is not present or has failed.	Check the security PAL at location U54 on the CMX controller. If the PAL is absent, install correct PAL. If security PAL is present, replace the CMX controller board.
ERROR: SHORT AT ADDRESS XXXX	Hardware failure in DRAM or CMX controller circuitry.	Replace DRAM. If message occurs with new DRAM, replace CMX controller board.
ERROR: WRITING TO FLASH	Hardware or software fault in flash memory.	Download the program again: Power off the printer and start over at step 21. If the message occurs again, replace the flash memory.
ERROR: WRONG CHECKSUM	The printer received the complete program but the checksum did not match. The data were corrupted during download.	Download the program again: Power off the printer and start over at step 21.
ERROR OCCURRED FLUSHING QUEUES *	An interim message that displays while the printer discards host data it cannot use because a fault condition exists. While this message displays, the asterisk (*) rotates.	Wait. When the asterisk (*) stops rotating, a different fault message will appear: troubleshoot the final message.
LOADING PROGRAM FROM PORT XX%	The new program is loading into printer RAM. XX indicates how much of the program has loaded.	None

Table 6: Flash Memory Message Guide

Message	Explanation	Required Action
LOADING PROGRAM INTO FLASH	The printer has deleted the previous program from flash memory and is loading the new program into flash memory.	None
PLEASE WAIT... RESET IN PROGRESS	The printer finished loading the program into flash memory and is automatically resetting itself.	None
RESTORING BOOT CODE	Normal download initialization message.	None
SECURITY CODE VIOLATION	The software running or being downloaded does not match the security PAL code.	Install the correct PAL or program. (PAL and program must match.)
SENDING PROGRAM TO EC PROCESSOR	The printer is loading the engine controller program into the engine controller.	None
TABLE MISMATCH DOWNLOAD AGAIN	EC software update in process.	Download the program again: Power off the printer and start over at step 21.

Set Shuttle Speed

IMPORTANT **Do this procedure if you replaced the CMX controller board and/or the shuttle frame assembly in a 475 or 500 lpm printer. Do not do this procedure if you removed and reinstalled the original CMX board or shuttle frame assembly from a 475 or 500 lpm printer as part of other maintenance tasks.**

Do not do this procedure on 800, 900, 1000, 1200, 1400, or 1500 lpm printers. Do not do this procedure on Kanji/Hanzi printers.

1. Raise the printer cover.
2. Power on the printer.
3. If the printer is on-line, press the **ON LINE** key to place the printer off-line. “OFFLINE / CONFIG. CONTROL” displays.
4. On the control panel, press the ▲ + ▼ keys to unlock the **ENTER** key. “ENTER SWITCH UNLOCKED” briefly displays. (This is the default key combination. The lock/unlock key combination can be programmed by the user. If ▲ + ▼ does not unlock **ENTER**, get the combination from the user.)
5. Press the ▲ + ▼ + ◀ + ▶ keys simultaneously to enter the Factory Menu. “Factory / Shuttle Speed” appears on the display.
6. Press the ▼ key.“Shuttle Speed / 500* ” or “Shuttle Speed / 475” appears on the display. The asterisk [*] indicates which shuttle speed is currently active.
7. Press the ▶ key until the shuttle speed you want appears on the display.
8. Press the **ENTER** key. An asterisk [*] appears next to the selection, indicating it is now the active shuttle speed.
9. Press the **ON LINE / CLEAR** key to exit the Factory Menu.
10. Press the ▲ + ▼ keys to lock the ENTER key. (Or use the key combination programmed by the user.) “ENTER SWITCH LOCKED” briefly displays.
11. **Cycle printer power to activate the shuttle speed setting: set the power switch to O, wait 15 seconds, then set the power switch to 1.**
12. Adjust the hammer phasing (page 128).
13. Adjust the paper out distance (page 124).
14. If the printer is on-line, press the **ON LINE** key to place the printer off-line. “OFFLINE / CONFIG. CONTROL” displays.
15. Press **PRT CONFIG**, then press **ENTER**. Verify that the configuration printout shows the correct SHUTTLE TYPE. If the shuttle type is incorrect, return to step 3 and do this procedure again.
16. Return the printer to normal operation (page 107).

5 *Replacement Procedures and Illustrated Parts Lists*

Organization of This Chapter

This chapter is divided into two sections.

- **Section I: Replacement Procedures**

  Written procedures for removing and installing components that are replaceable at the field service level of maintenance. The replacement procedures refer you to the illustrations in Section II.

  Section I begins on page 144.

- **Section II: Illustrated Parts Lists**

  Drawings of all electrical and mechanical assemblies in the printer. On the page facing each illustration is a list of the illustrated parts and their part numbers.

NOTE: Only field-replaceable spares are given part numbers in the illustrated parts lists. Part numbers are not listed for common fasteners and attachment hardware. Items marked “Ref” in the illustrations refer to parts that are not spared or are part of another assembly.

Section II begins on page 205.

Section I: Replacement Procedures

WARNING **Unplug the printer power cord from the printer or power outlet before doing any maintenance procedure. Failure to remove power could result in injury to you or damage to equipment. Only apply power during maintenance if you are instructed to do so in a maintenance procedure.**

IMPORTANT **The components specified in this chapter are field replaceable units (FRUs). FRUs must be repaired at the factory. Do not repair these items in the field.**
Do not attempt field repairs of electronic components or assemblies. Do not de-solder any circuit board components. Replace a malfunctioning electronic assembly with an operational spare. Most electronic problems are corrected by replacing the printed circuit board assembly, sensor, or cable that causes the fault indication. The same is true of failures traced to the hammer bank: it is not field repairable so you must replace the entire shuttle frame assembly. Hammer spring assemblies, the hammer bank cover, and the ribbon mask are the only replaceable components of the shuttle frame assembly.

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Belt, Paper Feed Timing

Removal

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Cabinet Models: Loosen four screws and remove the barrier shield. (See page 214, items 3, 4, and 9.)
   Pedestal Models: Loosen four screws and remove the paper guide and barrier shield. (See page 216, items 3, 4, and 5.)
4. Remove the timing belt cover by squeezing the front and back to release the plastic tabs from the slots in the side plate. (See page 214, item 7.)
5. Loosen the 7/64 inch setscrew in the paper feed motor pulley collar. (See page 230, item 8.)
6. Loosen (do not remove) the two 5/16 inch paper feed motor mount screws. (See page 230, item 10.)
7. Remove the paper feed timing belt by sliding the paper feed motor pulley off the motor shaft and the belt off the splined shaft pulley.

Installation

1. Install the paper feed timing belt over the splined shaft pulley and the motor pulley and collar. Slide the motor pulley and retaining collar onto the paper feed motor shaft.
2. Holding a 0.040 inch feeler gauge between the pulley collar and the motor body, torque the 7/64 inch collar screw to 25 ± 2 inch-pounds (2.82 ± 0.23 N•m).
3. Using the straight end of a force gauge, apply 15 pounds (66.7 N) of pressure to the paper feed drive motor. Use the splined shaft to steady the gauge.
4. Reduce tension to 12 pounds (53.4 N) and torque the 5/16 inch paper feed motor mount screws to 18 ± 2 inch-pounds (2.03 ± 0.23 N•m).
5. Snap the timing belt cover into the slots in the side plate. (See page 214, item 7.)
6. Cabinet Models: Install the barrier shield and tighten the four screws. (See page 214, items 3, 4, and 9.)
   Pedestal Models: Install the barrier shield and paper guide and tighten the four screws. (See page 216, items 3, 4, and 5.)
7. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).
8. Return the printer to normal operation (page 107).

Belt, Platen Open

Removal

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Remove the platen open belt cover by squeezing the top and bottom to release the plastic tabs from the slots in the side plate (page 228, item 24).
4. Loosen (do not remove) the two 5/16 inch mounting screws of the platen open motor (page 230, item 15).
5. Push the motor toward the front of the printer to loosen the platen open belt.
6. Loosen the 1/16 inch setscrew in the platen open motor pulley and remove the pulley. (See page 230, item 6.)
7. Remove the platen open belt by sliding the belt off the platen open pulley.

Installation

1. Slide the platen open timing belt over the platen open pulley and the motor pulley. Slide the motor pulley onto the platen open motor shaft and torque the 1/16 inch setscrew to 11 ± 2 inch-pounds (1.24 ± 0.23 N•m).
2. Finger tighten the two 5/16 inch screws securing the platen open motor.

CAUTION **Too much tension on the platen open belt can cause the platen gap to change, which can lead to premature wear of the platen, damaged hammer tips, and poor print quality.**

3. Using a force gauge, apply 10 pounds (44.48 N) of tension to the motor shaft by pushing in the direction away from the large platen pulley.
4. Reduce tension to 5 pounds (22.24 N) and torque the 5/16 inch motor mount screws to 18 ± 2 inch-pounds (2.03 ± 0.23 N•m).
5. Snap the platen open belt cover into the slots in the side plate.
6. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).
7. Return the printer to normal operation (page 107).

Circuit Breaker

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the card cage fan (page 164).
3. Disconnect the four circuit breaker electrical leads.
   (Cabinet Models: See page 232.
   Pedestal Models: See page 218.)
4. Press in on the spring clips and remove the circuit breaker from the printer.

Installation

1. Press the circuit breaker into the cutout until the spring clips snap into place.
   (Cabinet models: See page 232.
   Pedestal models: See page 218.)

CAUTION **To prevent severe damage to the printer, the circuit breaker electrical leads must be connected correctly.**

2. Connect the four circuit breaker electrical leads.
   (Cabinet Models: See page 232.
   Pedestal Models: See page 218.)
3. Install the card cage fan (page 164).
4. Return the printer to normal operation (page 107).

Connector Shells

Some of the cable connectors in the printer are grouped inside connector shells. The procedure below explains how to remove and install cable assemblies from any connector shell in the printer.

NOTE: There is also a diagram of the P106 and P107 connector shells on the plastic cover over the power supply.

Removal

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Disconnect the cable connector shell containing the cable assembly that you will replace.
4. Pull the side of the connector shell outward and gently pull the cable connector upward. (See Figure 19.) Notice that two-wire connectors are grouped across from two-wire connectors in a connector shell. Four-wire connectors are grouped across from four-wire connectors in a connector shell.
5. Disengage the key tab(s) on the cable connector from the slots in the side of the connector shell.
6. Remove the cable connector from the connector shell. (Remove only the cable connector for the cable you are replacing; leave the other cable connectors in the shell.)

Installation

1. Position the cable connector in the connector shell. Two-wire connectors are always grouped across from two-wire connectors in a connector shell. Four-wire connectors are always grouped across from four-wire connectors in a connector shell. (See Figure 19.)
2. Pull the side of the connector shell outward and gently push the cable connector down into the connector shell.
3. Engage the key tab(s) on the cable connector in the slots in the side of the connector shell. Press the sides of the connector shell inward to make sure all cable connector tabs are engaged in the shell slots.
4. Connect the cable connector shell to its printer connection.
5. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).
6. Return the printer to normal operation (page 107).

P106 Connector Configuration

2 4 6 8	10 12	14 16 18 20
LRIB M	LRP	PMD
PLAT M	CCF	POD
1 3 5 7	9 11	13 15 17 19

Pin No.

CCF = Card Cage Fan
LRIB M = Left Ribbon Motor
LRP = Left Ribbon Guide
PLAT M = Platen Open Motor
PMD = Paper Motion Detector (Switch)
POD = Paper Out Detect (Switch)

P107 Connector Configuration

2 4 6 8	10 12	14 16	18 20
RRIB M	HBF	RRP	JMP
PAPR M	EHF	PLO	MPU
1 3 5 7	9 11	13 15 17 19	

EHF* = Exhaust Fan
HBF = Hammer Bank Fan
JMP = Jumper Wire
MPU = Magnetic Pickup
PAPR M = Paper Feed Motor
PLO = Platen Open (Switch)
RRIB M = Right Ribbon Motor
RRP = Right Ribbon Guide

* JMP on pedestal models: used as a spacer

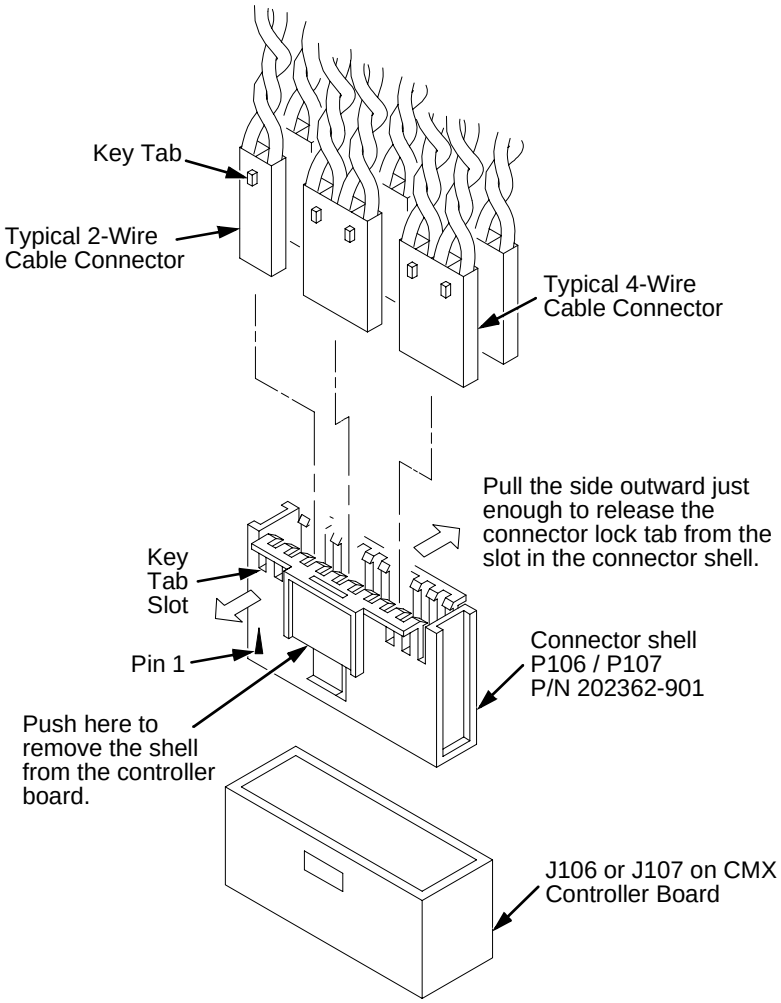

Key Tab
Typical 2-Wire Cable Connector
Typical 4-Wire Cable Connector
Pull the side outward just enough to release the connector lock tab from the slot in the connector shell.
Key Tab Slot
Pin 1
Connector shell P106 / P107 P/N 202362-901
Push here to remove the shell from the controller board.
J106 or J107 on CMX Controller Board

Figure 19. Cable Connector Shell, Disassembly/Assembly

Connector Stiffening Clips

Later model printers have connector stiffening clips on CMX board connectors P106 and P107. The clips are also available in a field kit for installation on earlier models. The clips stiffen connectors P106 and P107 and help prevent accidental removal of wires when the connector shells are disconnected from the CMX board.

Removal

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Unsnap the front (open side) of the clip from the connector shell, release the back of the clip from the lip of connector shell P107, and work the stiffening clip off the cable bundle. (See Figure 20.)
4. Repeat step 3 for the P106 connector.
5. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).
6. Return the printer to normal operation (page 107).

Installation

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Work the stiffening clip over the cable bundle, engage the back of the clip under the lip of connector shell P107, then snap the front (open side) of the clip down over the connector shell. (See Figure 20.)
4. Repeat step 3 for the P106 connector.
5. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).
6. Return the printer to normal operation (page 107).

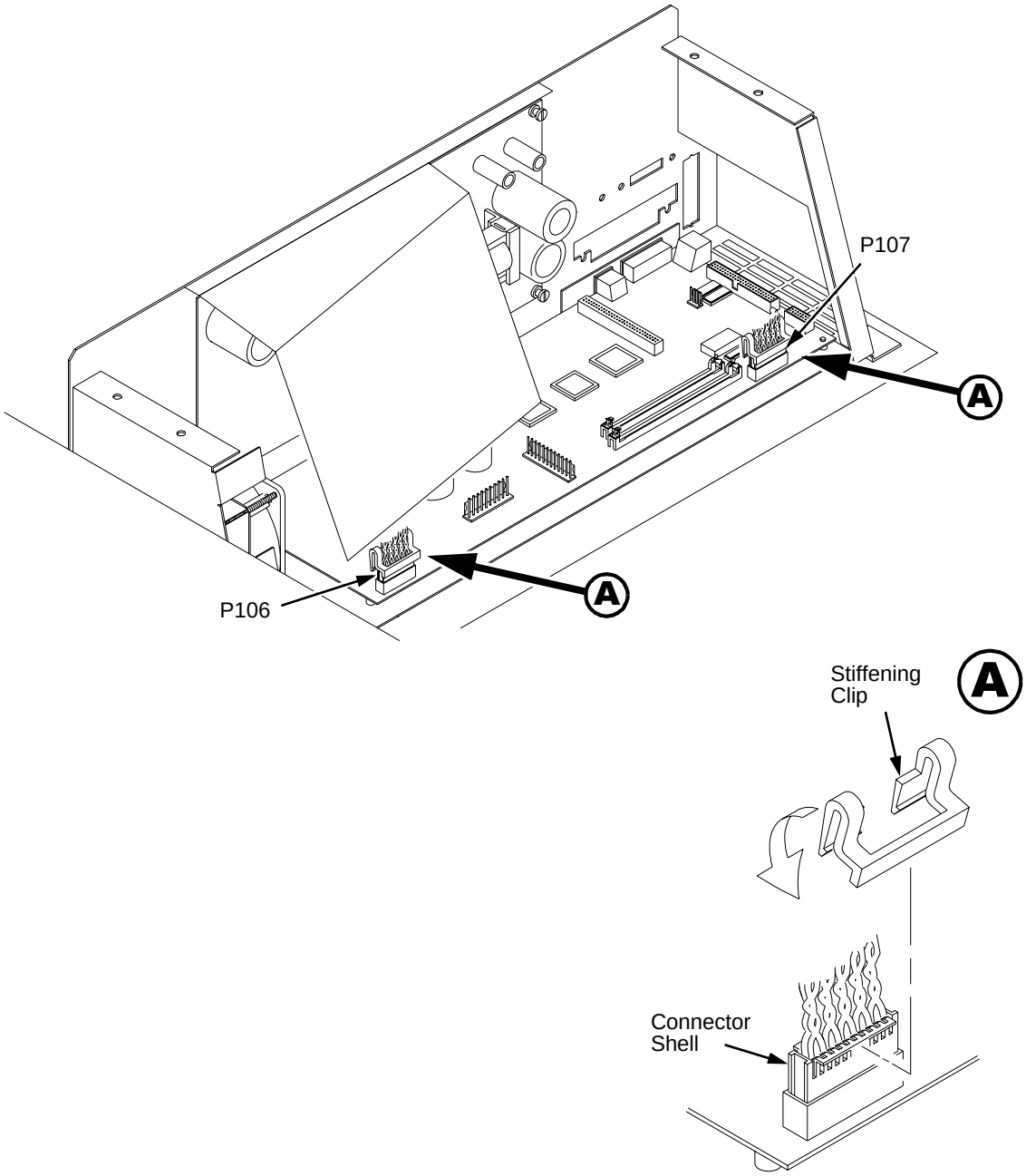


Figure 20. Connector Stiffening Clips

Control Panel Assembly, Cabinet Models

Removal

1. Prepare the printer for maintenance (page 106).
2. Disconnect RJ11 connector P310 from connector J310 on the control panel.
3. Loosen four screws securing the control panel to the control panel bracket. (See page 210, item 1.)
4. Remove the control panel assembly from the keyways in the control panel bracket.

Installation

1. Position the control panel assembly on the bracket, engage the mounting screws in the keyways, and hand tighten the screws. (See page 210, item 1.)
2. Connect RJ11 connector P310 to connector J310 on the control panel.
3. Lower the printer cover and center the control panel assembly in the cutout of the printer cover.
4. Open the printer cover and tighten the four control panel mounting screws.
5. Return the printer to normal operation (page 107).

Control Panel Assembly, Pedestal Models

Removal

1. Prepare the printer for maintenance (page 106).
2. Open the printer cover.
3. Loosen the four captive screws until the control panel is released from the printer top cover. (See page 212, item 2.)
4. Remove the two 5/16 inch screws securing the control panel ground straps. (See page 212, item 11.)
5. Lift the control panel and disconnect the RJ11 cable connector from the control panel assembly.
6. Remove the control panel assembly.

Installation

1. Reverse steps 2 through 6 of the removal procedure.
2. Return the printer to normal operation (page 107).

Controller Board (CMX)

Removal

CAUTION **To prevent electrostatic damage to electronic components, always wear a properly grounded static wrist strap when you handle circuit boards.**

1. Make a configuration printout of all saved configurations. (Refer to the *User's Manual.)*
2. Prepare the printer for maintenance (page 106).
3. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
4. Remove the expansion-CT board, if it is installed (page 162).
   Remove the PrintNet Ethernet interface assembly, if it is installed (page 185).
5. Disconnect all cable connectors from the controller board. (See page 220.)
6. Loosen but do not remove the two screws securing the controller shield near serial cable connector J201.
7. Loosen but do not remove the screw securing the controller shield to the bottom of the card cage, on the left side near the card cage fan.

CAUTION **Do not separate the CMX controller board from the controller shield. The shield serves as a stiffener and ground plane, and is an integral part of the CMX controller board assembly.**

8. Slide the controller board assembly to the left until the keyway clears the screw securing the controller board to the bottom of the card cage. Lift the controller board out of the printer.

Installation

CAUTION **To prevent electrostatic damage to electronic components, always wear a properly grounded static wrist strap when you handle circuit boards.**

NOTE: P5X05B, P5X10, P5014, and P5X15 printers must use the 40 MHz CMX controller board.

1. Position the controller board in the card cage, shield side down, component side up. Engage the screw on the bottom of the card cage in the keyway in the controller shield. Slide the board to the right until the serial cable connector J201 on the controller board lines up with the cutout in the card cage. (See page 220.)
2. Tighten the two screws securing the controller shield near serial cable connector J201.
3. Tighten the screw securing the controller shield to the bottom of the card cage.
4. Connect all cable connectors to the controller board, using the Interconnection Diagram in Appendix A as your guide.

5. Install the expansion-CT board, if necessary (page 162).
   Install the PrintNet Ethernet interface assembly, if necessary (page 185).
6. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).

IMPORTANT **If the original CMX board was replaced, you must download the emulation software again. Installing flash memory from the old board onto the new board does not transfer all operating system software.**

7. Load flash memory (page 130).
8. 475 and 500 lpm models only: set shuttle speed if the original CMX board was replaced (page 135).
9. Adjust the hammer phasing (page 128).
10. Adjust the paper out distance (page 124).
11. Using the configuration printout(s) you made as step 1 of the removal procedure, reset and save the printer configuration(s). (Refer to the *User's Manual.)*

Cover Assembly, Hammer Bank / Ribbon Mask

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the shuttle frame assembly (page 198).
3. Early models:
   Lift the thick plate of the hammer bank cover assembly at one end, and peel the cover away from hammer bank magnets. (See Figure 21.)
4. Later models:
   a. Using a Torx T-10 driver, remove the six screws and three ribbon mask clamp plates securing the ribbon mask to the hammer bank cover. Remove the ribbon mask. (See Figure 21.)

NOTE: If you are replacing just the ribbon mask, loosen the six screws until you can slip the ribbon mask off the alignment pins.

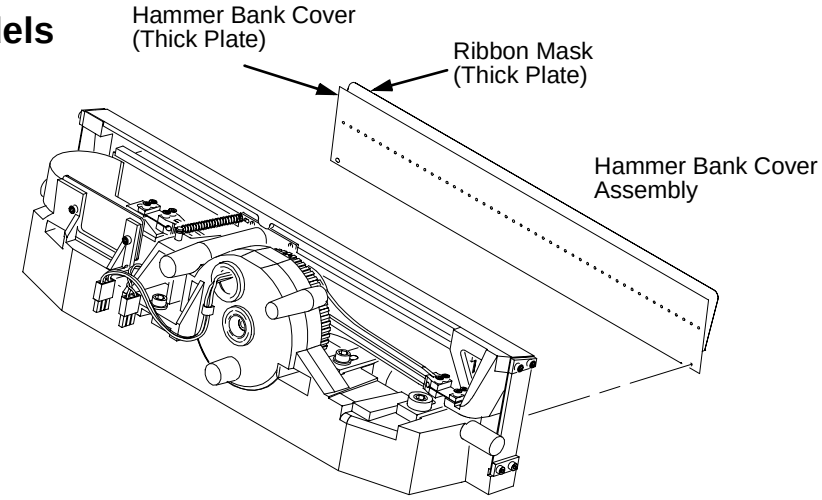
   b. Using a Torx T-10 driver, remove the 12 screws securing the hammer bank cover to the hammer bank. Remove the hammer bank cover. (See Figure 21.)

Installation

CAUTION **The hammer bank contains a strong magnet. To prevent damage to the hammer tips, do not let the steel hammer bank cover assembly of early models snap into place as the hammer bank magnet attracts it. Any impact of the cover against the hammer bank can break hammer tips.**

1. Early models:
   a. With the thick plate facing the hammer bank, engage the bottom edge of the hammer bank cover assembly on the alignment pins. Engage the round hole first, then the oblong hole, to ensure that the cover lies flat on the hammer bank.
   b. Gently lower the hammer bank cover assembly until it lies flush on the hammer bank.
   c. Check that the hammer bank cover assembly is properly positioned over the alignment pins and hammer tips.
2. Later models:
   a. Position the hammer bank cover on the alignment pins on the hammer bank. Make sure the hammer bank cover is properly positioned over the alignment pins and hammer tips and lies flat on the hammer bank.
   b. Install all 12 hold-down screws finger tight. Using a Torx T-10 driver, torque the hold-down screws to 14 inch-pounds (1.58 N•m) in the sequence shown in Figure 21.
   c. With the seam of the folded lower edge of the ribbon mask facing inward (toward the hammer bank cover), position the ribbon mask on the alignment pins on the hammer bank cover. The ribbon mask is correctly installed when the angled ends of the ribbon mask match the angled ends of the hammer bank cover. Install the three clamp plates and six screws finger tight. Using a Torx T-10 driver, torque the six screws to 14 inch-pounds (1.58 N•m) in the sequence shown in Figure 21.
3. Install the shuttle frame assembly (page 198).
4. Return the printer to normal operation (page 107).

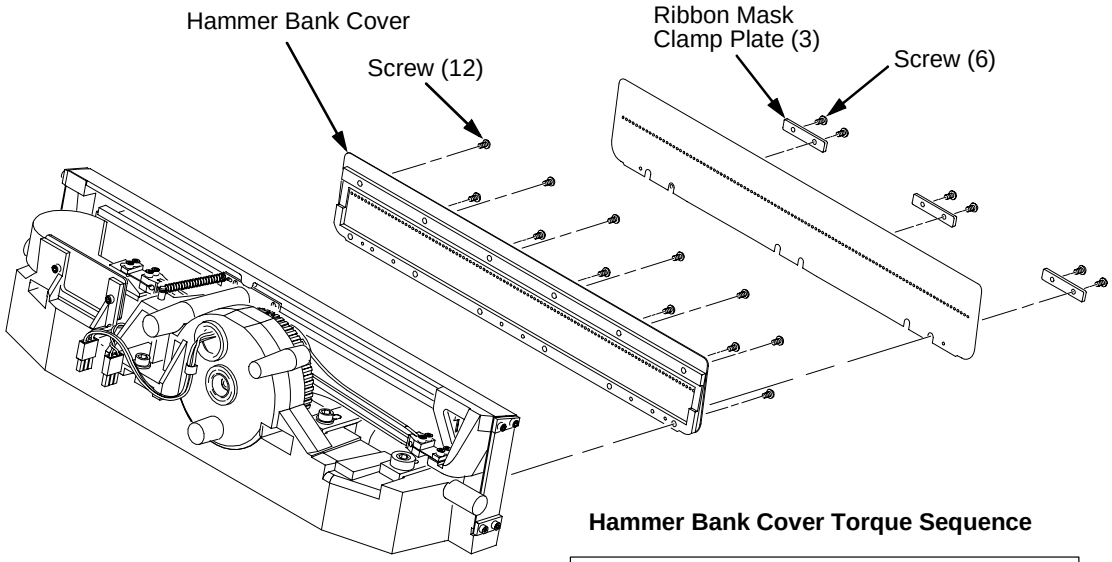
Early Models



Later Models

Ribbon Mask Torque Sequence

4	3	1	2	5	6



Hammer Bank Cover Torque Sequence

9	5	1	3	7	11
10	6	2	4	8	12

Figure 21. Hammer Bank Cover Assembly / Ribbon Mask

Cover Assembly, Shuttle

Removal

1. Prepare the printer for maintenance (page 106).
2. Loosen the shuttle cover screws (page 214, item 2).
3. Grasping the edges of the shuttle cover assembly, tilt the rear edge up and lift the shuttle cover assembly out of the printer.

Installation

1. Place the shuttle cover assembly in the printer. Tilt the forward edge of the cover down slightly and work the cover into position.

NOTE: Make sure the holes in the cover are over the locating pins on the base casting.

2. Tighten the shuttle cover screws (page 214, item 2).
3. Return the printer to normal operation (page 107).

Cover Assembly, Top, Pedestal Models

Removal

1. Prepare the printer for maintenance (page 106).
2. Loosen, but do not remove, the two #2 Phillips hold-down screws on the rear of the printer. (See page 212, item 5.)
3. Open the printer cover.
4. Loosen the four captive #1 Phillips screws until the control panel is released from the printer top cover. (See page 212, items 1 and 2.) Set the control panel assembly on the shuttle cover assembly.
5. Loosen the two captive #2 Phillips screws in the lower front corners of the top cover. (See page 212, item 3.)
6. Lift the top cover assembly off the printer base.

Installation

1. Reverse steps 2 through 6 of the removal procedure.
2. Return the printer to normal operation (page 107).

Expansion-CT

Removal

CAUTION **To prevent electrostatic damage to electronic components, always wear a properly grounded static wrist strap when you handle circuit boards.**

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Loosen, but do not remove, the two screws securing the coax/twinax I/O plate to the rear of the card cage. Loosen the thumbscrew on the expansion-CT board until the screw is released from the standoff on the controller board. (See page 234.)
4. Carefully lift the expansion-CT board out of the card cage cutout and off the expansion connector adapter that attaches the CT to the CMX board.
5. Remove the expansion connector adapter from the CMX controller board by carefully lifting it straight up and out of the controller connector.

Installation

1. Reverse steps 2 through 5 of the removal procedure.
2. Return the printer to normal operation (page 107).

Fan Assembly, Cabinet Exhaust

NOTE: This procedure applies only to cabinet models.

Removal

1. Prepare the printer for maintenance (page 106).
2. Open the front and rear cabinet doors and the printer cover.
3. Remove the paper fence/paper tray assembly. (See page 208.)
4. Remove the two 1/4 inch screws securing bottom of the air exhaust duct. (See page 210, item 4).
5. Remove the 1/4 inch screw directly below the forms thickness lever.
6. Disconnect the fan cable connector from connector P307 and remove the air exhaust duct.
7. Disconnect the fan cable connector from the side of the air exhaust duct.
8. Remove the two 1/4 inch fan mounting screws and the cabinet exhaust fan assembly.

Installation

CAUTION **Air flow is DOWN. Install the cabinet exhaust fan so the label on the fan faces down.**

1. Reverse steps 2 through 8 of the removal procedure.
2. Return the printer to normal operation (page 107).

Fan Assembly, Card Cage

Removal

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Disconnect the card cage fan cable connector. (See page 230.)
4. Cabinet Models: Remove the two fan mounting screws from the bottom of the fan. (See page 230, item 2.)
   Pedestal Models: Remove the four fan mounting screws and nut. (See page 218, items 1 through 4.)
5. Remove the card cage fan assembly from the card cage.

Installation

CAUTION **Air flow is INTO the card cage. Install the card cage fan so the label faces toward the inside of the printer and the cable faces the front of the printer.**

1. Reverse steps 2 through 5 of the removal procedure.
2. Return the printer to normal operation (page 107).

Fan Assembly, Hammer Bank

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the shuttle cover assembly (page 160).
3. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
4. Trace the hammer bank fan cable assembly back to the controller board connector P107, releasing it from all cable constraints. (See the cable routing diagrams in Appendix A.)
5. Disconnect the fan connector from connector shell P107 on the controller board. (See page 149.)
6. Remove the two screws securing the fan to the base casting. Angle the hammer bank fan assembly up and out of the base casting and feed the motor wires and cable connector out from between the base casting and the base pan. (See page 230, items 21 and 22.)

Installation

CAUTION **Air flow is UP. Install the hammer bank fan so the label faces up.**

1. Feed the hammer bank fan cable connector and motor wires between the fan well of the base casting and the base pan. Reach up under the base casting and route the fan cable to the right and angle the hammer bank fan assembly under the shuttle motor and down into the fan well. (See page 230.)
2. Route the fan motor wires (see cable routing diagrams, Appendix A) and connect the fan cable connector to J107 on the controller board. (See page 149.)
3. Install two screws in the locations shown in Figure 41 (page 230, item 21).
4. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).
5. Install the shuttle cover assembly (page 160).
6. Return the printer to normal operation (page 107).

Hammer Spring Assembly

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the shuttle frame assembly (page 198).
3. Carefully vacuum the shuttle frame assembly.
4. Remove the hammer bank cover assembly (page 157).

CAUTION **Hammer springs and hammer tips are fragile. Do not touch the hammer springs or tips. Handle hammer spring assemblies by the thick mounting base only. Apply pressure only to the mounting base.**

5. Remove the mounting screws from the old hammer spring assembly. (See Figure 22, page 167.)
6. Handling the hammer spring assembly by the mounting base only, gently push up the mounting base and pry the old spring assembly off its mounting pins. (See Figure 22, page 167.)
7. Inspect the hammer bank and the old hammer spring assembly:
   a. If there is ink on the hammer bank mounting surface, the hammer spring assembly mounting surface, or the hammer spring neck or tines, reinstall the old hammer spring assembly and replace the shuttle frame assembly (page 198).
   b. If the old hammer spring assembly and the hammer bank are free of ink, install the new hammer spring assembly, as shown in the next section.

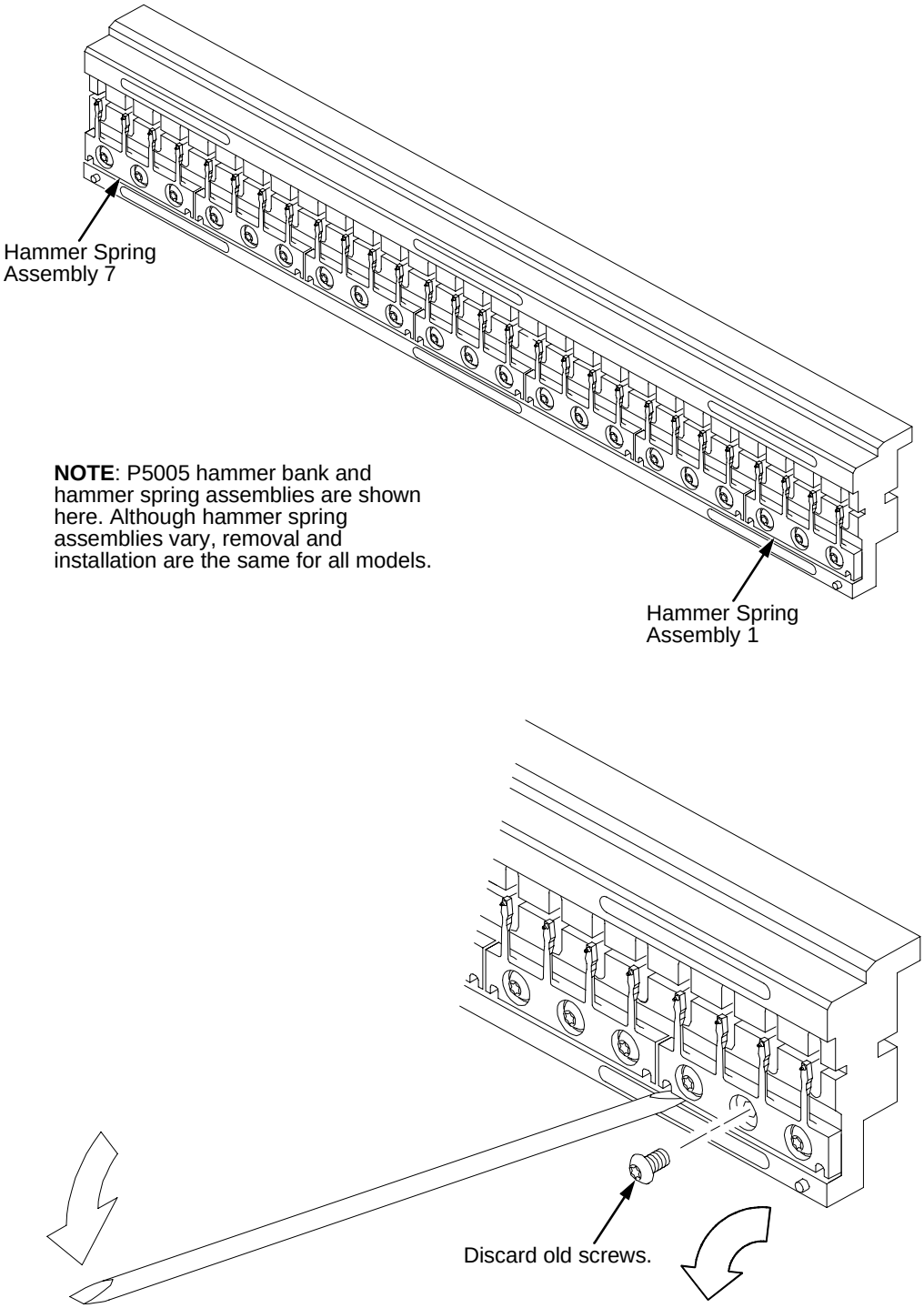

Hammer Spring Assembly 7
NOTE: P5005 hammer bank and hammer spring assemblies are shown here. Although hammer spring assemblies vary, removal and installation are the same for all models.
Hammer Spring Assembly 1
Discard old screws.

Figure 22. Hammer Spring Assembly, Removal

Installation

1. Using a clean dry cloth, wipe the hammer spring mounting surface on the hammer bank. Make sure the cloth does not leave lint on the hammer bank.

CAUTION **Hammer springs and hammer tips are fragile. Do not touch the hammer springs or tips. Handle hammer springs by the thick mounting base only. Apply pressure only to the mounting base.**

2. Handling the hammer spring assembly by the mounting base only, remove the new assembly and mounting screws from the box.
3. Handling the hammer spring assembly by the mounting base only, carefully position the new assembly onto the hammer bank mounting pins and press it into position with the stick supplied in the hammer spring replacement kit. (See Figure 23, page 169.)
4. Install the mounting screws from the replacement kit. Using a Torx T-10 bit adapter, torque each screw to 14 in-lbs (1.58 N•m). Tighten the center screw(s) first. (See Figure 23, page 169.)
5. Install the hammer bank cover assembly (page 157).
6. Install the shuttle frame assembly (page 198).
7. Install the ribbon and load paper.

CAUTION **Do not attempt to adjust or “tweak” hammer springs.**

8. Run a Diagnostic Printer Test and check print quality (page 89):
    a. If print quality is acceptable, return the printer to normal operation (page 107).
    b. If print quality is still degraded, replace the shuttle frame assembly (page 198).

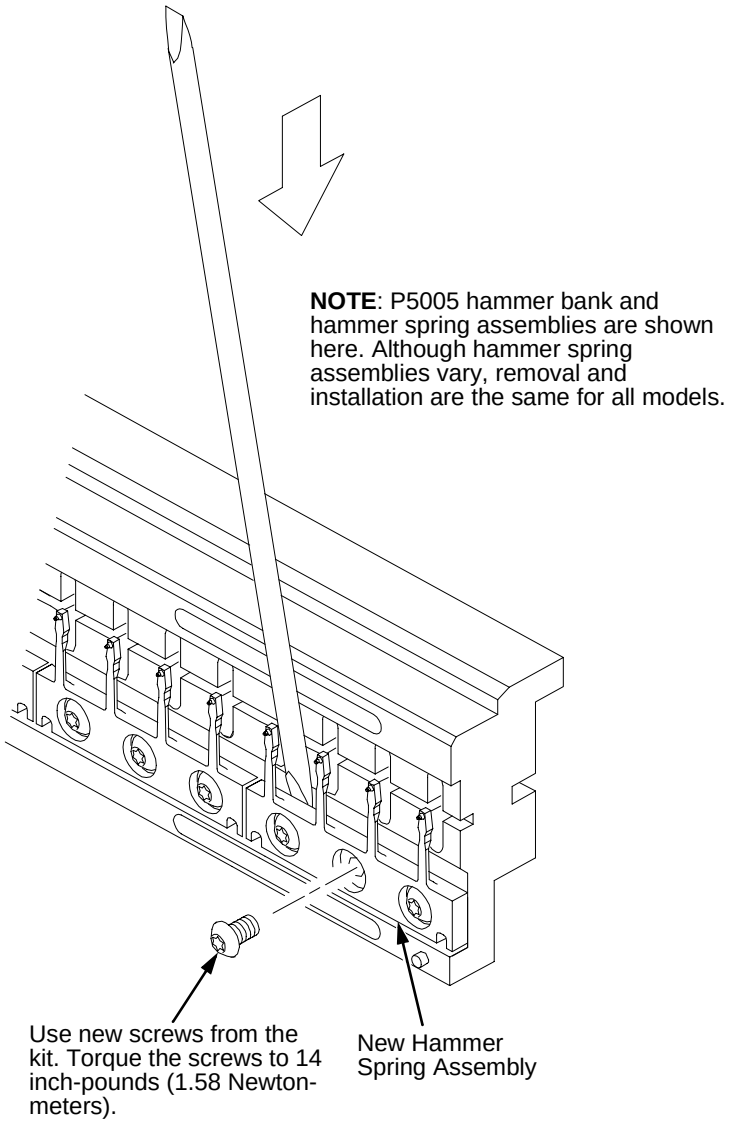

NOTE: P5005 hammer bank and hammer spring assemblies are shown here. Although hammer spring assemblies vary, removal and installation are the same for all models.
Use new screws from the kit. Torque the screws to 14 inch-pounds (1.58 Newton-meters).
New Hammer Spring Assembly

Figure 23. Hammer Spring Assembly, Installation

Magnetic Pickup (MPU) Assembly

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the shuttle cover (page 160).
3. Disconnect the magnetic pickup (MPU) cable connector (page 224, item 5).
4. Loosen the 7/64 inch hex MPU clamp screw (page 224, item 3).
5. Unscrew the MPU assembly from the MPU bracket.

Installation

1. Install the MPU assembly by screwing it into the MPU bracket. (See Figure 38, page 224).
2. Using a feeler gauge, adjust the gap between the MPU assembly and the flywheel to 0.010 ± .001 inch (0.254 ± 0.025 mm). Torque the 7/16 inch MPU clamp screw to 18 ± 1 inch-pounds (2.03 ± 0.11 N•m).
3. Check the gap between the MPU assembly and the flywheel with a feeler gauge:
   a. If the gap is 0.010 ± .001 inch (0.254 ± 0.025 mm), go to step 4.
   b. If the gap is not 0.010 ± 0.001 inch (0.254 ± 0.025 mm), loosen the MPU clamp screw and go back to step 2.
4. Route the MPU cable under the extension spring and connect the MPU cable connector (page 224, item 5). Make sure the MPU cable does not touch the extension spring after cable connection.
5. Install the shuttle cover (page 160).
6. Adjust the hammer phasing (page 128).
7. Return the printer to normal operation (page 107).

Memory Modules and Security PAL

CAUTION **To prevent electrostatic damage to electronic components, always wear a properly grounded static wrist strap when you handle memory modules and circuit boards.**

Removal

1. Make a configuration printout of all saved configurations. (Refer to the *User's Manual.)*
2. Prepare the printer for maintenance (page 106).
3. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
4. Gently pry the side locks open, angle the SIMM toward the front of the printer, and remove the SIMM from the socket. (See Figure 24, page 173.)
5. If a new PAL is required, remove the old PAL. (See Figure 24, page 173.)

The printer uses one of six possible security PAL's, depending on the emulation and hardware options used by the customer:

- PAL 1: LP+ / CT
- PAL 2: LP+ / CT / IGP
- PAL 3: IPDS
- PAL 4: IPDS / IGP
- PAL 5: ANSI
- PAL 6: ANSI / IGP

Some emulations will run under more than one security PAL, as shown below:

Emulation	Security PAL Number					
	1	2	3	4	5	6
LP+	✓	✓	✓	✓	✓	✓
LP+/PGL		✓		✓		✓
LP+/VGL		✓		✓		✓
ANSI (Genicom 4440)					✓	
ANSI/PGL						✓
ANSI/VGL						✓
CT/LP+	✓	✓	✓	✓	✓	✓
CT/PGL/LP+		✓		✓		✓
CT/VGL/LP+		✓		✓		✓
CT/IPDS/LP+			✓	✓		

Emulation	Security PAL Number					
	1	2	3	4	5	6
CT/IPDS/PGL/LP+				✓		
CT/IPDS/VGL/LP+				✓		

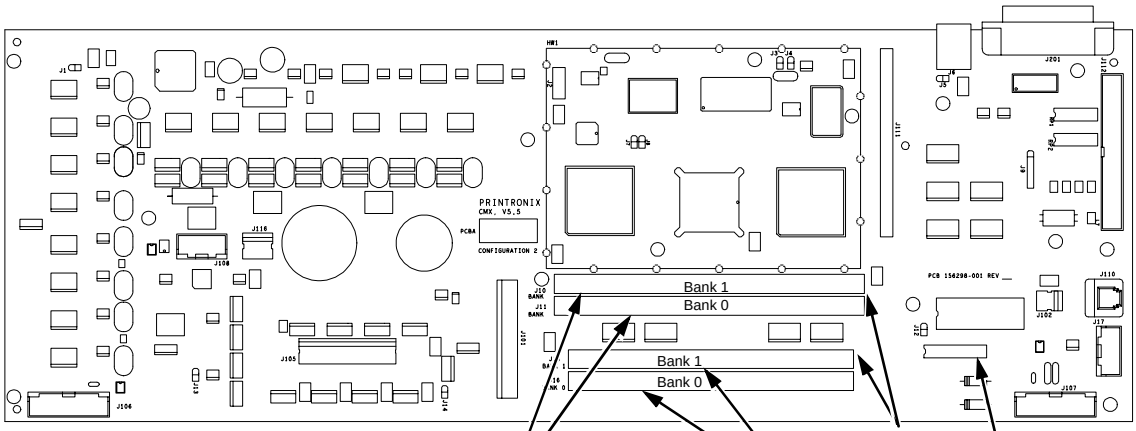
Installation

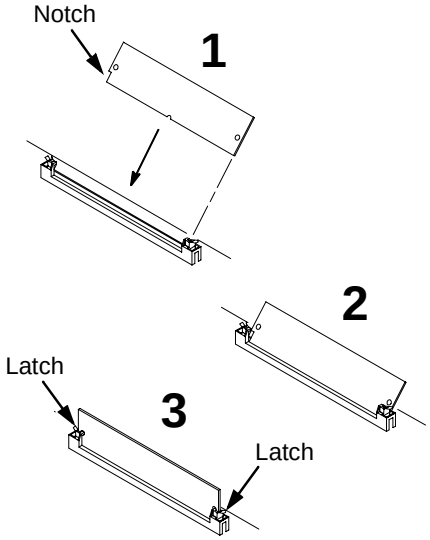
CAUTION **To prevent electrostatic damage to electronic components, always wear a properly grounded static wrist strap when you handle memory modules and circuit boards.**

NOTE: Flash SIMMs from one CMX controller board must be placed in the same slot on a replacement CMX controller board. Installing flash memory from one controller board to another does not transfer all operating system software, so you must download the emulation again.

1. Observing the correct pin orientation, install the new security PAL, if required by the emulation. (See the chart on page 171 and Figure 24 on page 173.)
2. Insert the memory module into the correct socket on the CMX controller board:
   a. Position the SIMM with the notched end toward the right side of the CMX controller board. (See Figure 24, page 173.)
   b. Press the SIMM into the socket with the top of the SIMM angled *away* from the center of the board. When the SIMM is seated in the socket, gently push on the ends until it locks in the upright position.
3. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).
4. Download the emulation (page 130).
5. Return the printer to normal operation (page 107).
6. Using the configuration printout(s) you made in step 1 of the removal procedure, reset and save the printer configuration(s). (Refer to the *User's Manual.)*

CMX Controller Board





Flash:

80-pin SIMM

J11 = Bank 0 (must always be filled)

J10 = Bank 1
Reserved for upgrades

If 1 Flash SIMM, use Bank 0

If 2 Flash SIMMs, use both banks but put pre-programmed SIMMs in J11

DRAM:

72-pin SIMM

J16 = Bank 0 (must always be filled)

J15 = Bank 1
Reserved for upgrades

If 1 DRAM SIMM, use Bank 0

If 2 DRAM SIMMs, use both banks (It does not matter which SIMM goes into which bank*

*CMX does not support EDO RAM

IMPORTANT:
No matter what combination of SIMMs is used, J11 and J16 must always be filled. The CMX board does not support EDO RAM.

Memory Requirements for Emulation Options

Emulation Options	LP+	IGP LP+	ANSI LP+	PGL ANSI LP+	VGL ANSI LP+	CT LP+	CT PGL LP+	CT VGL LP+	IPDS CT LP+	IPDS CT PGL LP+	IPDS CT VGL LP+
Flash	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB
DRAM	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB	4 MB
CT Installed	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

Figure 24. Memory Modules and Security PAL

Paper Feed Motor

Removal

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Cabinet Models: Loosen four screws and remove the barrier shield. (See page 214, items 3, 4, and 9.)
   Pedestal Models: Loosen the four screws and remove the barrier shield and paper guide. (See page 216, items 3, 4, and 5.)
4. Remove the timing belt cover by squeezing the front and back to release the plastic tabs from the slots in the side plate (page 214, item 7).
5. Loosen, but do not remove, the two 5/16 inch paper feed motor mounting screws. (See page 230, item 10.)
6. Loosen the 7/64 inch shaft collar setscrew and remove the paper feed motor pulley, shaft collar, and paper feed timing belt. (See page 230, items 7, 8, and 9.)
7. Trace the paper feed motor cables back to the controller board, releasing it from tie wraps. (See the cable routing diagrams in Appendix A.)
8. Disconnect connector P107 from the controller board and remove the paper feed motor connector from connector P107. (See page 150.)

NOTE: Some paper feed motors are mounted with nuts and bolts; other motors have threaded flanges, eliminating the need for nuts.

9. Remove the motor mount screws (and nuts, if present).
10. Remove the paper feed motor assembly.

Installation

1. Position the paper feed motor assembly on the right side plate and install the motor mount bolts and nuts finger tight. (See page 230, items 10 and 23.)
2. Connect the paper feed motor cable connector to connector P107, then connect P107 to J107 on the controller board. (See page 150.)
3. Install the collar, paper feed motor pulley, and timing belt.
4. Align the paper feed motor pulley with the splined shaft pulley.

IMPORTANT **Make sure there is at least 0.040 inches (1.016 mm) of clearance between the collar/pulley and the motor face plate.**

5. Hold the collar snug against the motor pulley and torque the 7/64 inch setscrew to 25 ± 2 inch-pounds (2.82 ± 0.23 N•m).
6. Using the straight end of a force gauge, apply 12 pounds (53.4 N) of pressure to the paper feed motor. Use the splined shaft to steady the gauge.
7. Reduce pressure to 9 pounds (40.0 N) and torque the 5/16 inch motor mount screws to 18 ± 2 inch-pounds (1.36 ± 0.23 N•m).
8. Snap the timing belt cover into the slots in the side plate.
9. Cabinet Models: Install the barrier shield and tighten the four screws. (See page 214, items 3, 4, and 9.)
   Pedestal Models: Install the barrier shield and paper guide and tighten the four screws. (See page 216, items 3, 4, and 5.)
10. Cabinet Models: Install the paper path (page 177).
    Pedestal Models: Install the top cover assembly (page 161).
11. Return the printer to normal operation (page 107).

Paper Ironer

WARNING **Over time, the upper edge of the paper ironer can become sharp. To avoid cutting yourself, handle the paper ironer on the sides.**

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the shuttle frame assembly (page 198).
3. Move the forms thickness lever to the open position.
4. Push the ends of the paper ironer toward the rear of the printer, disengage the tabs, then lift it up and out (page 228, item 3).

Installation

NOTE: The black tape on the paper ironer faces toward the rear of the printer and toward the paper detector switch assembly.

1. Position the paper ironer so the black tape is on the side that faces the rear of the printer, towards the paper detector switch assembly. (See page 228, item 3.)
2. Push the paper ironer down into the slots until the tabs engage.
3. Install the shuttle frame assembly (page 198).
4. Return the printer to normal operation (page 107).

Paper Path

NOTE: This procedure applies only to cabinet models.

Removal

1. Prepare the printer for maintenance (page 106).
2. Loosen the three paper path hold-down screws (page 214, item 6).
3. Slide the paper path to the left and lift it off the card cage.

Installation

1. Position the paper path offset slightly to the left on the card cage with the keyway cutouts over the three loosened hold-down screws page 214, Figure 33).
2. Slide the paper path to the right, engaging the three hold-down screws in the keyway slots. Slide the paper path to the right as far as it will go.
3. Tighten the three hold-down screws (page 214, item 6).
4. Return the printer to normal operation (page 107).

Platen

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the shuttle frame assembly (page 198).
3. Remove the paper ironer (page 176).
4. Remove the three 1/4 inch screws securing the paper ironer bracket assembly and remove the assembly. (See page 178, items 4, 5, and 6.)
5. Remove the platen open belt (page 147).
6. Remove the platen pulley (page 228, item 21), as follows:
   a. Loosen the 7/64 inch collar clamp screw.
   b. Pull the platen pulley off the platen shaft.
7. Pull the spring link and white plastic bushing off the platen shaft and remove the spring link, bushing, and spring. (See page 228, items 16, 17, and 18.)
8. Remove the forms thickness lever by loosening the 7/64 inch clamp screw and pulling the lever off the platen shaft. (See page 228, item 15.)
9. Remove the right side platen support spring by repeating step 7 on the right side of the platen.
10. Remove the Phillips #1 screw and washer securing the forms thickness indicator plate from the inside of the right side bracket. (See page 228, items 9 and 10.)
11. Pull the indicator plate, with the interlock switch assembly attached, off the platen shaft.
12. Remove the two 7/32 inch screws and washers securing the right ribbon guide assembly to the side plate. (See page 230, items 11, 13, and 14.)
13. Slide the ribbon guide assembly out of the side plate.
14. Pull the right side of the platen toward the front of the printer and move the platen to the right and out of the left side plate. (Hold the black metal washer on the left side of the shaft as you remove the platen. Make sure the wear saddles in the platen seat of the mechanism base stay in place.)

Installation

IMPORTANT **The dowel pins protruding from the ends of the platen are the platen shafts. The platen shafts are not of equal length. The platen must be installed with the longer shaft on the right side.**

1. Wipe the platen shafts clean of grease and debris.
2. Install two washers on the longer (right) platen shaft. (See Figure 25 below.)
3. Apply bearing lubricant to both platen shafts.

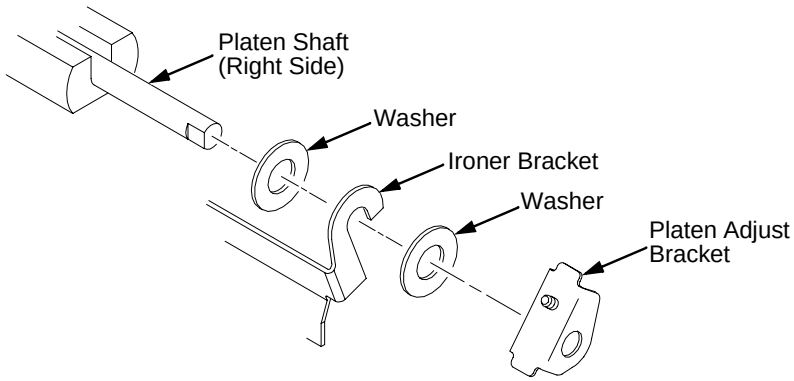


Figure 25. Installing the Platen Adjust Bracket

4. Make sure the two wear saddles are set flush into the corners of the mechanism base platen seat. (See Figure 26 below.)
5. Apply a layer of bearing lubricant 1/4 inch high to the seat of each wear saddle, making the layer as wide as the saddle and touching the rear angled surface.
6. Install one platen adjust bracket onto the longer platen shaft, with the screw at the top of the bracket.
7. Place the other bracket onto the left side mechanism base platen seat so that the mechanism base platen seat is between the flanges of the bracket.
8. Insert the shorter platen shaft through the left adjust bracket and through the opening in the left side plate. Rotate the longer shaft into the opening in the right side plate and position the adjustment brackets as shown in Figure 26.

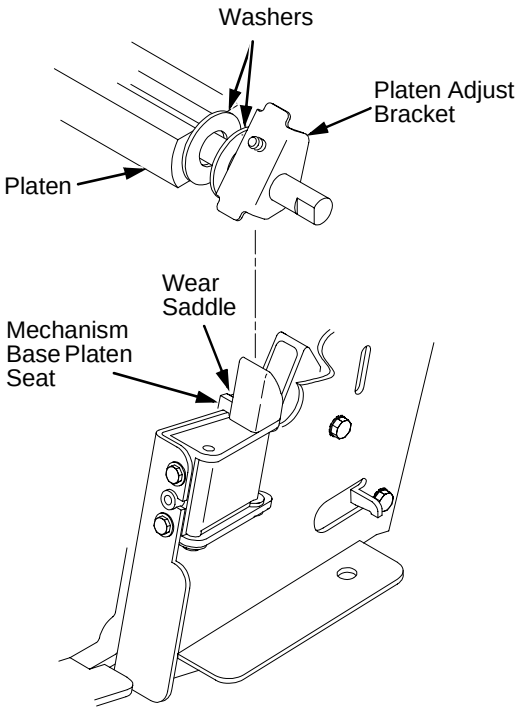


Figure 26. Positioning the Platen Adjust Brackets

9. Slide the right ribbon guide assembly into the side plate and install the two 7/32 inch screws and washers. (See Figure 41, items 11, 13, and 14.)
10. Install the forms thickness indicator plate:
    a. Slide the indicator plate, with the interlock switch assembly attached, onto the platen shaft and up against the right side plate.
    b. Install the Phillips #1 screw and washer securing the indicator plate.
11. Install the black metal washer onto the left side of the platen shaft. (See page 228, item 26.)
12. Apply bearing lubricant to the nylon bearings in the two spring links, slide the spring links onto the two platen shafts, and connect the springs to the spring hooks in the side plates. (See page 228, items 16, 17, and 18.)
13. Apply bearing lubricant to the two platen shafts on both sides, between the ends of the platen and the platen adjustment brackets.
14. Install the paper ironer bracket. (See Figure 25.)
    a. With the flat part of the bracket facing the front of the printer, place the two hooks of the upper part of the paper ironer over the platen shafts.

       The left hook of the paper ironer bracket goes between the left platen adjustment bracket and the platen.

       On the right side of the platen, a washer goes on both sides of the paper ironer bracket hook and the hook goes to the left of the right platen adjustment bracket. (See Figure 25.)

b. Install and torque three screws to 20 ± 2 inch-pounds (2.26 ± 0.23 N•m).

15. Push the platen to the left.
16. Install the forms thickness lever onto the right side platen shaft, pressing the interlock switch out of the way as the lever slides past it. Tighten the 7/64 inch setscrew. (See page 228.) Open and close the forms thickness lever to make sure the setscrew does not touch the right ribbon guide.
17. Install the platen shaft pulley with the 7/64 inch setscrew facing up and tighten the setscrew. Open and close the forms thickness lever and check that the platen pulley setscrew does not hit the left ribbon guide.
18. Install, but do not adjust, the platen open belt and platen open motor pulley (page 228, items 21 and 23).
19. Install the paper ironer with the black tape towards the rear of the printer (page 228, item 3).
20. Install the shuttle frame assembly (page 198).
21. Adjust the platen gap (page 116).
22. Adjust the platen open belt (page 110).
23. Check ribbon guide alignment (page 120).
24. Check the hammer phasing (page 128).
25. Return the printer to normal operation (page 107).

Platen Open Motor

Removal

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Cabinet Models: Remove the card cage fan (page 164).
4. Remove the platen open belt cover by squeezing the top and bottom to release the plastic tabs from the slots in the side plate (page 228, item 24).
5. Loosen the two 5/16 inch motor mount screws (page 230, item 15).
6. Loosen the 1/16 inch hex pulley setscrew and remove the motor pulley and platen open belt.
7. Trace the platen open motor cables back to connector P106 on the controller board, releasing the cables from all tie-wraps. (See cable routing diagrams in Appendix A.)
8. Remove the platen open cable connector from connector P106. (See page 150.)

NOTE: Some platen open motors are mounted with nuts and bolts; other motors have threaded flanges, eliminating the need for nuts.

9. Remove the two 5/16 inch motor mount screws (and nuts, if present).
10. Remove the platen open motor assembly.

Installation

1. Position the platen open motor assembly with the wires toward the rear (page 230, item 5).
2. Install the two 5/16 inch motor mount screws (and nuts, if present) finger tight.
3. Install the platen open belt and motor pulley. Bottom out the motor pulley on the motor shaft and torque the 1/16 inch setscrew to 11 ± 2 inch-pounds (1.24 ± 0.23 N•m).
4. Connect the platen motor cable connector to connector shell P106.
5. Connect shell connector P106 to the controller board and install tie-wraps to secure the motor cable. (See the wire routing diagrams in Appendix A.)
6. Close the forms thickness lever all the way.
7. Finger tighten the two 5/16 inch screws securing the platen open motor.

CAUTION **Too much tension on the platen open belt can change the platen gap, which can lead to premature wear of the platen, damaged hammer tips, and poor print quality.**

8. Using a force gauge, apply 10 pounds (44.48 N) of tension to the platen open motor shaft by pushing away from the large platen pulley, reduce tension to 5 pounds (22.24 N) and torque the 5/16 inch motor mount screws to 18 ± 2 inch-pounds (2.03 ± 0.23 N•m).
9. Snap the platen open belt cover into the slots in the side plate.
10. Cabinet Models: Install the card cage fan (page 164).
11. Cabinet Models: Install the paper path (page 177).
    Pedestal Models: Install the top cover assembly (page 161).
12. Return the printer to normal operation (page 107).

Power Supply Board

WARNING **To prevent injury from electric shock, wait at least one minute after shutting off power before removing the power supply board. Do not touch components or flex the board during removal or installation. Handle the board by its sides and always wear a properly grounded static wrist strap when handling the power supply board.**

Removal

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161.
3. Disconnect output connector P101 from the controller board and AC input connector P1 from the power supply board. (See page 220, items 4 and 5.)
4. Loosen the three captive screws securing the power supply board to the rear wall of the card cage. (See page 220, item 15.)
5. Carefully pry the power supply board off the three studs on the rear wall of the card cage.
6. Remove the power supply board from the card cage.

Installation

1. Reverse steps 2 through 6 of the removal procedure.
2. Return the printer to normal operation (page 107).

PrintNet Ethernet Interface Assemblies

NOTE: The PrintNet LAN option is available in one of three configurations: 10Base-T, 10Base2, or 10/100Base-T. These options are available factory installed or as a field kit. Removal and installation is the same for all versions.The functions of the LEDs and DIP switches on the Ethernet Interface boards are described on page 186 and page 188.

Removal

CAUTION **To prevent electrostatic damage to electronic components, always wear a properly grounded static wrist strap when you handle circuit boards.**

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Disconnect Centronics cable connector P112 from connector J112 on the CMX controller board. (See page 236, item 5.)
4. Open the ferrite clamp and lift the Centronics cable out of the ferrite clamp.
5. Loosen the two screws securing the PrintNet Ethernet interface assembly to the cutout at the rear of the card cage.
6. Slide the PrintNet Ethernet interface assembly out of the cutout in the card cage and lift the assembly out of the card cage.

Installation

CAUTION **To prevent electrostatic damage to electronic components, always wear a properly grounded static wrist strap when you handle circuit boards.**

1. Reverse steps 2 through 6 of the removal procedure.
2. Return the printer to normal operation (page 107).

10Base2 and 10Base-T LEDs and DIP Switches

10Base2 and 10Base-T PrintNet Ethernet interfaces have three LEDs and three DIP switches, as shown below. The indicators and switches are adjacent to the data line connectors. LED patterns are defined in the table below the illustration.

Status Indicator LEDs and DIP Switches

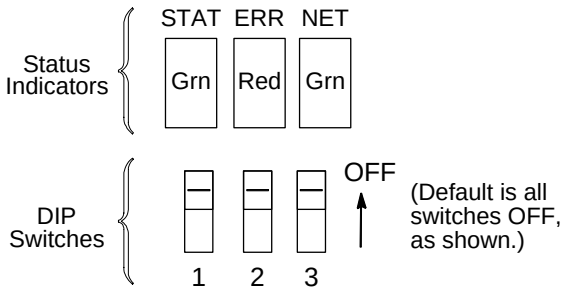


Table 7. LED Pattern Indications

STAT (System Status)	ERR (System Error)	NET (Data to Network)	Mode
ON	OFF	ON	RAM Test
ON	OFF	OFF	ROM Test
ON	ON	OFF	EEPROM Test
OFF	ON	ON	Network Interface Test
OFF	OFF	ON	PRN1 Test
FLASH	OFF	FLASH	Run Mode
FLASH	ON	FLASH	Auto Reset Mode
FLASH	FLASH	OFF	Firmware Panic
ON	FLASH	ON	Hardware Exception

The PrintNet Ethernet assembly has a self test and two internally controlled modes:

Power-on Self Test: A seven stage power-on self test performs diagnostics on the Ethernet Interface processor, RAM, ROM, EEPROM, parallel port, and network interface. The STAT, ERR, and NET LEDs indicate which test is currently in progress.

Run Mode and Auto Reset Mode: Run Mode is the normal operating state of the Ethernet Interface. Auto Reset mode is entered when the watchdog timer is triggered and the Print Server resets itself. In either mode, the STAT LED flashes differently, depending on whether the unit IP address is configured. The Run Mode and Auto Reset Mode indicator descriptions are shown below.

Table 8. Run Mode and Auto Reset Mode Indicator Descriptions

STAT	Rate	Indicates
Flashes On	once per second	Normal Mode, IP address configured
Flashes On	2.5 times per second	Monitor Mode, IP address not configured
Flashes Off	2.5 times per second	Monitor Mode or Download Mode, IP address not configured
Flashes Off	once per 2 seconds	Download Mode, IP address configured

IMPORTANT **Setting both DIP Switch 1 and DIP Switch 2 to the ON (down) position will clear ALL passwords, specifically passwords in the html webpage.**

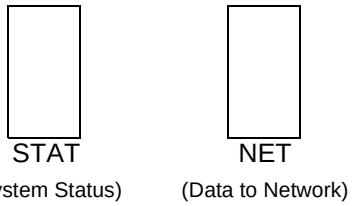
DIP Switch 1 = EEPROM Enable: Default position is OFF (up). Setting this switch to the ON (down) position and powering the printer off then on resets the Ethernet Interface to the factory default settings. This also erases any previously configured IP address. Before reconfiguring the unit, DIP switch 1 must be set back to the OFF (up) position, otherwise it will lose its configuration through another power on/off cycle.

DIP Switch 2 = Default IP: Default position is OFF (up). Setting this switch to the ON (down) position and powering the printer off then on resets a previously configured IP address to the factory default setting (no IP address). However, this does not cause the unit to lose its other stored configuration settings, as happens with DIP switch 1. Before reconfiguring the unit with an IP address, DIP switch 2 must be set back to the OFF (up) position, otherwise it will lose its IP address through another power on/off cycle.

DIP Switch 3 = Link Integrity Disable: Default position is OFF (up), which means link integrity is enabled. This DIP switch determines whether link integrity is turned on or off in the Ethernet interface. It may be necessary to turn link integrity off if the unit is connected to an older hub, etc. Link integrity only applies to the 10Base-T interface option.

10/100Base-T LEDs and Dipswitches

The 10/100Base-T PrintNet Ethernet interface has two indicator lights, as shown below.



Run and Auto Reset Modes

Run Mode is the normal operating state of this interface. Auto Reset mode is entered when the watchdog timer is triggered and the print server resets itself. In either mode, the STAT LED flashes at a varying rate, depending on whether the unit IP address is configured. The Run Mode and Auto Reset Mode indicator descriptions are shown in Table 9.

Table 9. Run Mode and Auto Reset Mode Indicator Descriptions

STAT	Rate	Indication
Flashes On	once per second	Normal Mode, IP address configured
Flashes On	2 times per second	IP address not configured
Flashes Off	once per second	Download (MOS)
Flashes Off	twice per second	Error
On	constantly	Indicates link integrity
Flashes Off	1/3 second	Flashes off 1/3 second each time a packet is transmitted

Dipswitches

On the back of the 10/100Base-T PrintNet Ethernet interface (inside the printer) are two dipswitches labeled 1 and 2. The functions of these dipswitches are explained in Table 10.

Table 10. 10/100Base-T Dipswitch Settings

Dipswitch		Description
1	2	
OFF	OFF	**Normal operation**. With both dipswitches in the “OFF” position, the PrintNet interface boots up using the settings in flash memory rather than the default settings.
ON	OFF	**Factory default settings**. With the dipswitches in this configuration, the PrintNet interface boots up and all settings stored in flash memory are erased except the Ethernet address and key value.
OFF	ON	**Default IP**. With the dipswitches in this configuration, the PrintNet interface boots up with factory default settings, but the stored settings in flash memory remain intact. Setting dipswitch 2 to “ON” does not clear any settings stored in flash memory, it boots the unit in a different state with the settings in flash memory temporarily ignored.
ON	ON	If the PrintNet interface is connected to a network with link integrity and then reset to MOS, a download will be forced. If the unit is not connected to a network, it will print a test page.

Resistors, Terminating

For parallel interface configurations, the printer is equipped with 470 ohm pull-up terminating resistors and 1K ohm pull-down terminating resistors on the controller board. These are suitable for most applications. (See Figure 27, page 191.)

If the standard terminating resistor pack is not compatible with the particular interface driver requirements of the host computer, other values of pull-up and pull-down resistors may be required. 220 Ohm pull-up and 330 Ohm pull-down alternate terminating resistors are provided with the printer. If you install the 220 Ohm pull-up resistor, you must also install the 330 Ohm pull-down resistor. Possible terminating resistor combinations are shown below.

Configuration	RP1 (Pull-Up)	RP2 (Pull-Down)
Factory Default	470 Ohm	1K Ohm
Alternate 1	220 Ohm	330 Ohm
Alternate 2	1K Ohm	None

Removal

CAUTION **To prevent electrostatic damage to electronic components, always wear a properly grounded static wrist strap when you handle circuit boards.**

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Locate the terminating resistor packs. (See Figure 27, page 191.)
4. Using a chip puller, remove the resistor packs.

Installation

CAUTION **To prevent electrostatic damage to electronic components, always wear a properly grounded static wrist strap when you handle circuit boards.**

1. Using a chip installation tool, install the resistor packs in the correct socket. (See Figure 27, page 191.)
2. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).
3. Return the printer to normal operation (page 107).

CMX Controller Board

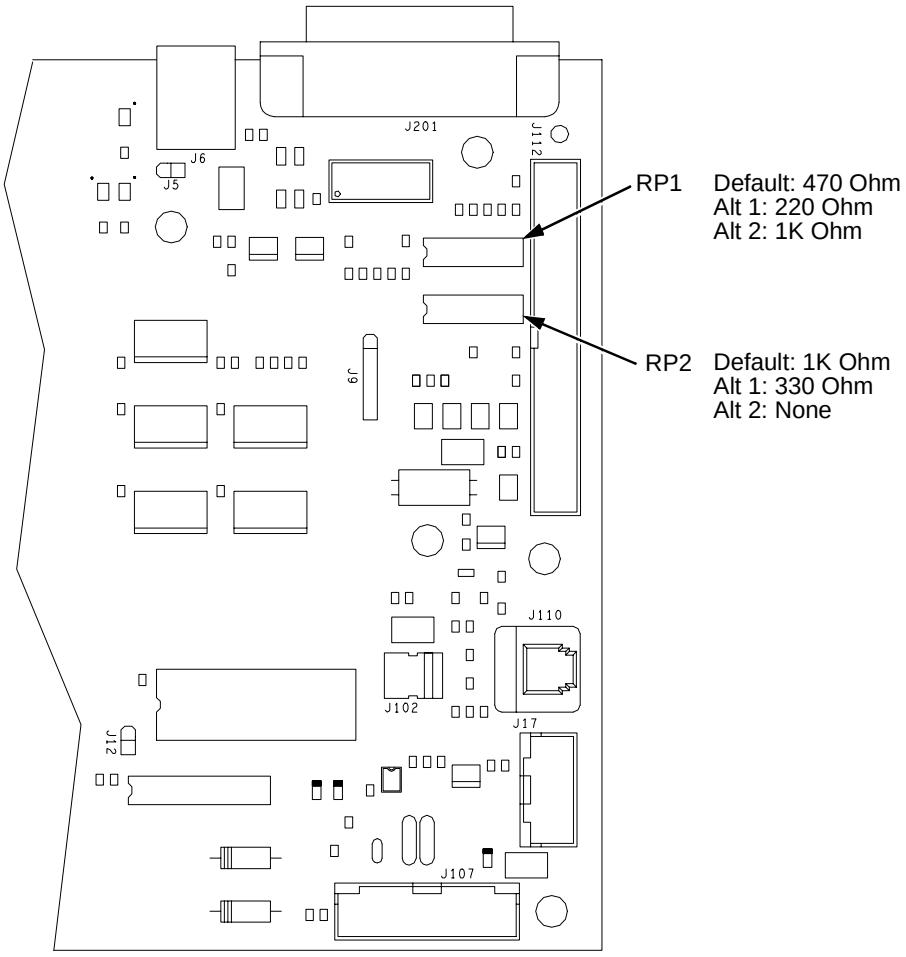


Figure 27. Terminating Resistors, Removal/Installation

Ribbon Drive Motor

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the ribbon hub (page 194).
3. Remove two screws and washers securing the ribbon drive motor to the base casting. (See page 230, items 18 and 19.)
4. Lift and rotate the ribbon drive motor until the motor cable is aligned with the slot on the base casting.
5. Disconnect the ribbon drive motor cable connector.
6. Remove the ribbon drive motor.

Installation

1. Reverse steps 2 through 6 of the removal procedure above.

NOTE: The ribbon drive motor should be secured at the front right and rear left corners. (See page 230, item 17.)

2. Return the printer to normal operation (page 107).

Ribbon Guide Assembly (L/R)

NOTE: The right ribbon guide is shown exploded in Figure 41 on page 230. The removal procedure is the same for both ribbon guides.

Removal

1. Prepare the printer for maintenance (page 106).
2. Cut and remove the tie-wrap from the tie wrap hole to free the ribbon guide cable. (See page 230, item 11.)
3. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
4. Trace the ribbon guide cable back to the controller board, releasing it from the cable restraints. (See the cable routing diagrams in Appendix A.)
5. For the left ribbon guide, disconnect connector shell P106 from the controller board. For the right ribbon cable, disconnect connector shell P107 from the controller board.
6. Trace the ribbon guide wires to the connector shell, and remove the cable connector from the connector shell (page 150).
7. Remove the two 7/32 inch screws and washers securing the ribbon guide assembly to the side plate. (See page 230, items 13 and 14.)
8. Slide the ribbon guide assembly out of the side plate.

Installation

1. Reverse steps 2 through 8 of the removal procedure above.
2. Align the ribbon guides (page 120).
3. Return the printer to normal operation (page 107).

Ribbon Hub

Removal

1. Prepare the printer for maintenance (page 106).
2. Loosen the Torx T-10 screw in the ribbon spool hub (page 230, item 20).
3. Remove the hub from the shaft of the ribbon drive motor.

Installation

1. Install the ribbon spool hub over the motor shaft (page 230, item 20).
2. Tighten the Torx T-10 hub screw so that it contacts the flat section of the motor shaft.
3. Return the printer to normal operation (page 107).

Shaft, Splined

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the paper supports from the splined shaft and support shaft. (See page 226, item 20.)
3. Remove the paper feed timing belt (page 146).
4. Remove the 1/4 inch screw securing the ground clip, and remove the clip (page 226, items 10 and 11).
5. With grip ring pliers, remove the grip ring from left side of the splined shaft (page 226, item 6).
6. Pull the bearing and spring link with the spring off the left side of the splined shaft (page 226, items 7, 8, and 9).
7. Unlock the left and right tractors and slide them to the center of the shaft.
8. Remove the 1/4 inch screw securing the bearing clamp on the right side of the splined shaft, and remove the clamp (page 226, items 13 and 14).
9. Hold the tractors so they do not fall, grasp the vertical adjustment knob, and slide the splined shaft to the right out of the side plates and the tractors.

Installation

1. Open the doors on the left and right tractors. Position the tractor belts so the alignment marks are at the top on both tractors. (See Figure 28 below.)
2. Grasp the vertical adjustment knob and slide the splined shaft through the right side plate, the tractors, and the left side plate. (See page 226.) Make sure the same spline passes the marked groove on each tractor.
3. Install the bearing clamp and screw.
4. Apply a thin film of bearing lubricant to the bearing.
5. Slide the spring link and bearing onto the left side of the splined shaft with the white nylon bushing flange to the outside of the printer.
6. Attach the spring to the left side plate and the spring link.
7. Install the grip ring on the splined shaft with 0.010 inches of clearance between the grip ring and the nylon bearing.
8. Install the ground clip and screw.
9. Install the paper feed timing belt (page 146).
10. Set the paper feed timing belt tension (page 108).
11. Adjust splined shaft skew (page 122).
12. Install the paper supports on the splined shaft and support shaft. (See page 226, item 20.)
13. Return the printer to normal operation (page 107).

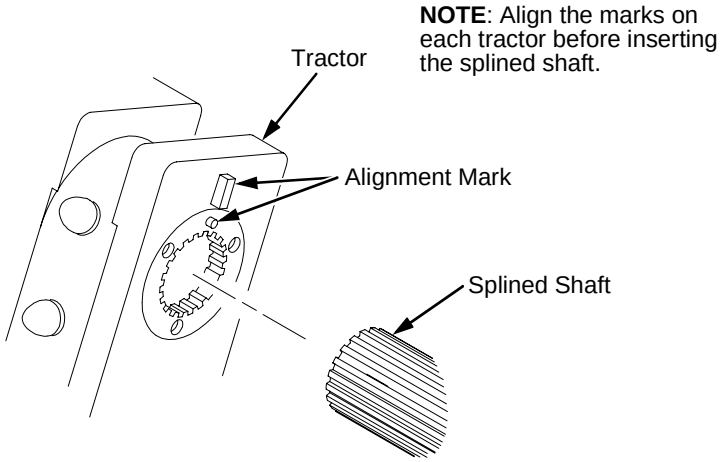


Figure 28. Splined Shaft and Tractor Installation

Shaft, Support

Removal

1. Prepare the printer for maintenance (page 106).
2. Unlock the tractors and slide them to the far right.
3. Remove the paper supports from the splined shaft and support shaft. (See page 226, item 20.)
4. Remove the E-ring (page 226, item 17).

NOTE: Hold the tractors while removing the support shaft. Be careful not to lose the curved spring washers. (See page 226, item 5.)

5. Slide the support shaft assembly—consisting of the support shaft, two curved washers, bushing, horizontal adjustment knob, washer and screw—to the left, out of the tractors and the left side plate. (See page 226, items 1 through 5 and 15.)

Installation

1. Slide the support shaft assembly—consisting of the support shaft, two curved washers, bushing, horizontal adjustment knob, washer, and screw—into the left side plate. (See page 226, items 1 through 5 and 15.)
2. Slide the tractors onto the support shaft.
3. Slide the support shaft assembly through the right side plate.
4. Push the horizontal adjustment knob to compress the curved washers and install the E-ring in the groove on the support shaft.
5. Install the paper supports to the splined shaft and support shaft. (See page 226, item 20.)
6. Return the printer to normal operation (page 107).

Shuttle Frame Assembly

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the shuttle cover assembly (page 160).
3. Disconnect the MPU cable connector P03 and shuttle motor cable connector P02 (page 224, items 5 and 6).

CAUTION **To prevent electrostatic damage to electronic components, always wear a properly grounded static wrist strap when you handle the shuttle frame assembly.**

4. Disconnect the hammer drive and hammer logic cable connectors from the terminator board on the shuttle frame assembly. (See page 220.)
5. Loosen the side 5/32 inch socket head clamp screws on each end of the shuttle and pull the clamps back and off the guide shaft. Do not remove the clamps. Hand tighten the clamp screws to hold the clamps back.
6. Loosen the center 5/32 inch socket head screw enough to release the shuttle frame assembly from the base casting.
7. Unlock and slide the tractors outward as far as they will go on the tractor support shaft.
8. Open the forms thickness lever all the way.
9. Grasping the support legs cast on both sides of the shuttle motor, lift the shuttle frame assembly out of the base casting. Lift it slowly and carefully: the shuttle frame assembly is heavy.

Installation

1. Install the hammer bank / ribbon mask cover assembly if it was removed (page 157).

CAUTION **To prevent electrostatic damage to electronic components, wear a properly grounded static wrist strap when you handle the shuttle frame assembly.**
DO NOT remove the grease from the shaft of the replacement shuttle frame assembly. The shuttle shaft is aluminum, and the clamped ends of the shaft must be greased to prevent galling.

2. Open the forms thickness lever and move the tractors as far left and right as possible.
3. Holding the shuttle frame assembly by the support legs cast on both sides of the shuttle motor, set it into the base casting (page 220). **Use both hands: the shuttle frame assembly is heavy.**
4. Align the center 5/32 inch socket head screw in the base casting and hand turn the screw until only two or three threads have started.
5. Pull the shuttle frame assembly toward the front of the printer and hold it in this position while you do step 6.

CAUTION **Do not over-tighten the shuttle frame assembly clamp screws.**

6. Slide the side clamps over the guide shaft and torque the 5/32 inch socket head clamp screws to 20 ± 2 inch-pounds (2.26 ± 0.23 N•m).
7. Torque the center captive 5/32 inch socket head screw to 20 ± 2 inch-pounds (2.26 ± 0.23 N•m).
8. Connect the hammer drive and hammer logic cable connectors to the terminator board on the shuttle frame assembly.
9. Connect the shuttle motor cable connector. (See page 224, item 6.)
10. Route the MPU cable under the extension spring and connect the MPU cable connector. (See page 224, item 5.) Make sure the MPU cable does not touch the extension spring after it is connected.
11. If the shuttle assembly is a new or refurbished unit, adjust the platen gap (page 116); otherwise, skip to step 12.
12. Install the shuttle cover assembly (page 160).
13. 475 and 500 lpm models only: set shuttle speed if original shuttle frame assembly was replaced (page 135).
14. Adjust the hammer phasing (page 128).
15. Return the printer to normal operation (page 107).

Spring Assembly, Gas

CAUTION **Two persons may be required to do this procedure. Prop or hold the printer cover securely while disengaging the gas spring assembly.**

NOTE: This procedure applies only to cabinet models.

Removal

1. Prepare the printer for maintenance (page 106).
2. Open the cabinet rear door.
3. Pry back the spring retaining clips. (See Figure 31, page 210.)
4. Remove the gas spring assembly from the ball studs.

Installation

CAUTION **The gas spring assembly must be installed with the gas cylinder in the uppermost position.**

Two persons may be required to do this procedure. Prop or hold the printer cover securely while installing the gas spring assembly.

1. Position the gas spring assembly against the ball studs on the upper and lower brackets. (See Figure 31, page 210.) The gas cylinder must be uppermost.
2. Using external grip ring pliers to spread the retaining clips, push the gas spring assembly onto the ball joints and slide the spring clips over the top (bottom) of the ball joint into the retaining grooves.
3. Close the printer cover.
4. Return the printer to normal operation (page 107).

Spring, Extension, Hammer Bank

CAUTION **Do not let the hammer bank rotate toward the platen during spring replacement.**

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the shuttle cover assembly (page 160).
3. Unhook the extension spring from the spring lugs on the hammer bank and shuttle frame. (See page 224, item 4.)

Installation

1. Apply a dab of bearing lubricant to both spring lugs.

CAUTION **Do not let the hammer bank rotate toward the platen during spring replacement. Make sure the extension spring does not touch the MPU cable after installation.**

2. Hook the extension spring over the spring lugs. (See page 224, item 4.)
3. Install the shuttle cover assembly (page 160).
4. Return the printer to normal operation (page 107).

Switch Assembly, Paper Detector

Removal

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Cabinet Models: Loosen four screws and remove the barrier shield. (See page 214, items 3, 4, and 9.)
   Pedestal Models: Loosen the four screws and remove the paper guide and barrier shield. (See page 216, items 3, 4, and 5.)
4. Remove the two 1/4 inch screws securing the paper detector switch assembly. (See page 230, item 4.)
5. Trace the paper detector switch cables back to controller board connector P106, removing all tie wraps. (See the cable routing diagrams in Appendix A.)
6. Disconnect connector shell P106 from the controller board (page 150).
7. Trace the paper detector switch cables to the connector shell, and remove the PMD and POD cable connector from the connector shell (page 149).
8. Remove the paper detector switch assembly.

Installation

1. Holding the slotted wheel against the PMD sensor, position the paper detector switch assembly and install the two 1/4 inch screws securing it to the printer base. (See page 230, item 4.)
2. Check PMD sensor arm range: make sure it travels freely and completely back into the sensing cavity.
3. Route the switch cables back to the controller board connector P106. (See the cable routing diagrams in Appendix A.)
4. Connect switch cables PMD and POD to the connector shell (page 150), then connect P106 to controller board connector J106.
5. Cabinet Models: Install the barrier shield and tighten the four screws. (See page 214, items 3, 4, and 9.)
   Pedestal Models: Install the barrier shield and paper guide and tighten the four screws. (See page 216, items 3, 4, and 5.)
6. Cabinet Models: Install the paper path (page 177).
   Pedestal Models: Install the top cover assembly (page 161).
7. Check the paper out adjustment (page 124).
8. Return the printer to normal operation (page 107).

Switch Assembly, Platen Interlock

Removal

1. Prepare the printer for maintenance (page 106).
2. Cabinet Models: Remove the paper path (page 177).
   Pedestal Models: Remove the top cover assembly (page 161).
3. Fully close the forms thickness lever (position ‘A’).
4. Trace the platen interlock switch cable back to the controller board. Remove tie-wraps as necessary to free the cable. (See cable routing diagrams in Appendix A.)
5. Disconnect connector shell P107 from the controller board.
6. Remove the platen interlock cable connector from the connector shell (page 150).
7. Remove two Phillips #1 screws securing the platen interlock switch assembly. (See page 228, item 11.)
8. Remove the platen interlock switch assembly from the switch bracket.
9. Remove the switch cable from the cutout in the right side plate.

Installation

1. Reverse steps 2 through 9 of the removal procedure.
2. Return the printer to normal operation (page 107).

Tractor (L/R)

Removal

1. Prepare the printer for maintenance (page 106).
2. Remove the support shaft (page 197).
3. Remove the splined shaft (page 195).

Installation

1. Using the replacement tractors, install the support shaft (page 197).
2. Install the splined shaft (page 195).
3. Return the printer to normal operation (page 107).

Section II: Illustrated Parts Lists

NOTE: Only field-replaceable spares are given part numbers in the illustrated parts lists. Part numbers are not listed for common fasteners and attachment hardware. Items marked “Ref” in the illustrations refer to parts that are not spared or are part of another assembly.

Illustrations of Printer Components

Figure 29. Top Cover, Doors, and Casters (page 206)

Figure 30. Paper Fence and Chains (page 208)

Figure 31. Control Panel and Cabinet Details (page 210)

Figure 32. Pedestal Details (page 212)

Figure 33. Inside Covers, Cabinet Models (page 214)

Figure 34. Inside Covers and Card Cage, Pedestal Models (page 216)

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Figure 41. Motors, Fans, and Paper Detector Switch (page 230)

Figure 42. Circuit Breaker, Cabinet Models (page 232)

Figure 43. Expansion-CT Board (page 234)

Figure 44. PrintNet Ethernet Interface Assemblies (page 236)

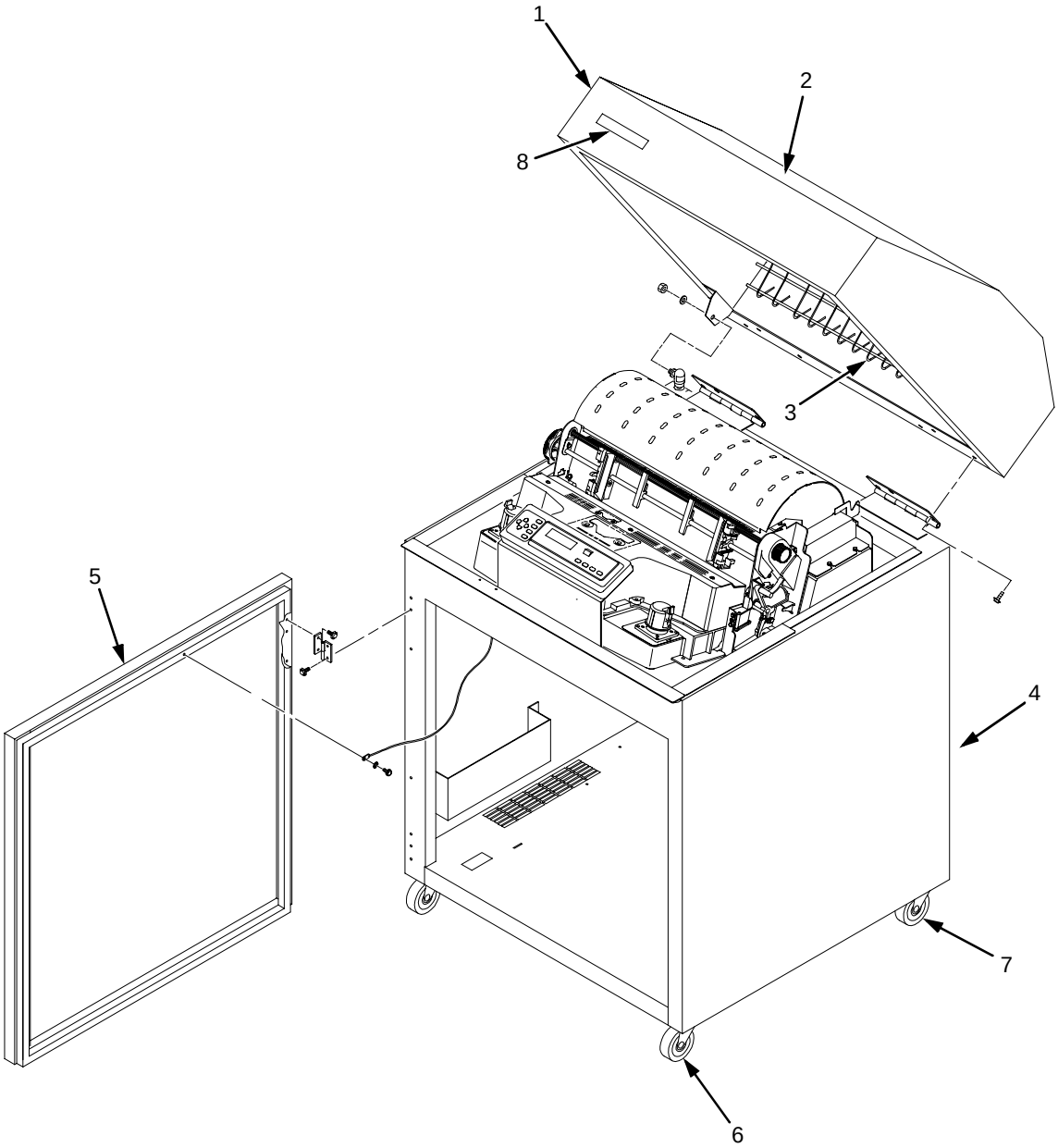


Figure 29. Top Cover, Doors, and Casters

Item No.	Part No.	Description	Notes
1	164212-905	Top Cover Kit, Cabinet	Includes mounting hardware
2	131803-901	Window, Top Cover	Not visible in
3	153640-901	Wireform Paper Path	Includes mounting hardware (Part of 1533997-001, Field Kit, Paper Path, Standard)
4	153084-902	Rear Door Kit	Includes mounting hardware
5	153084-903	Front Door Kit	Includes mounting hardware
6	141278-901	Caster, with Brake	Two at front
7	141278-902	Caster, without Brake	Two at rear
8	Ref	Logo	

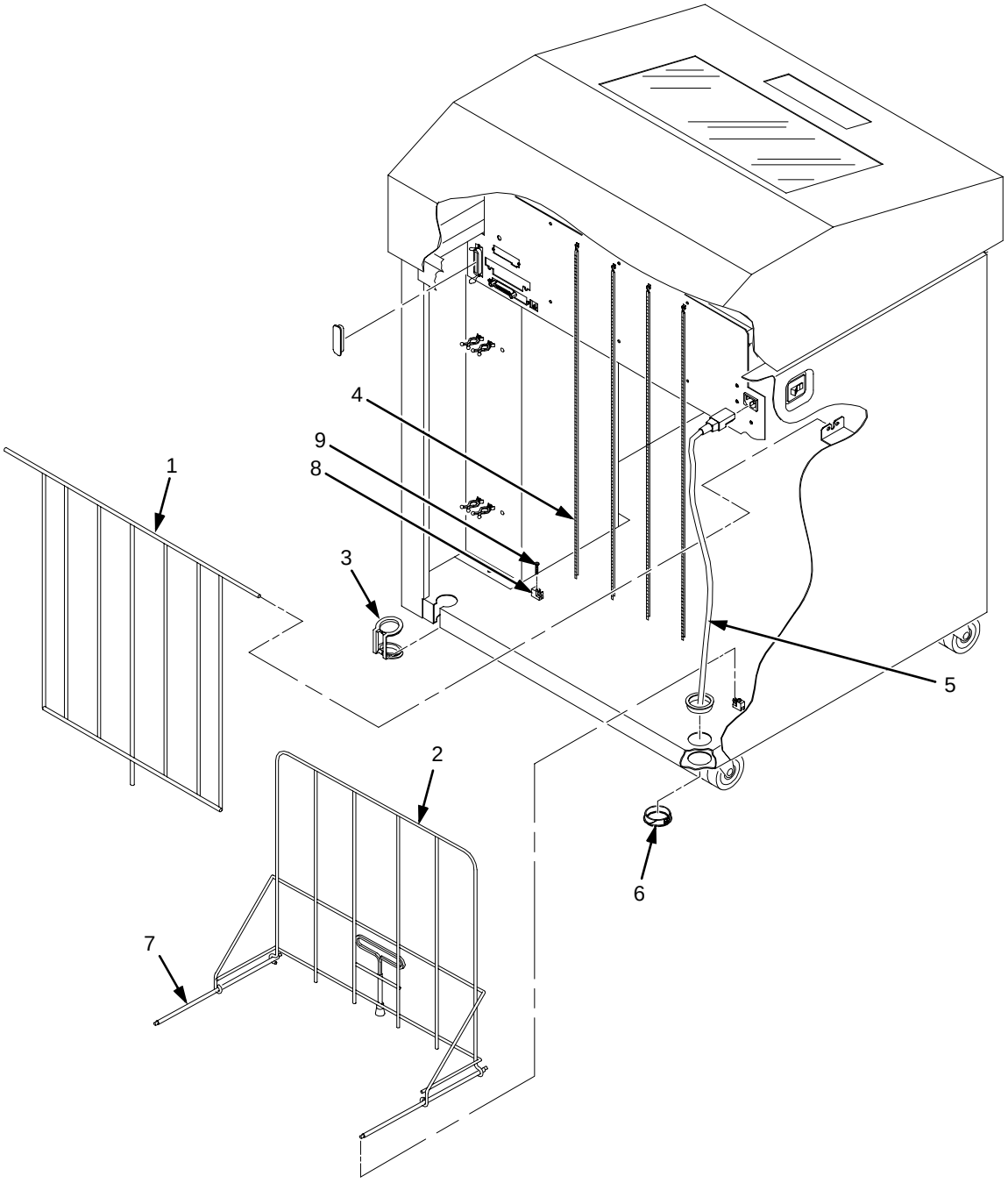


Figure 30. Paper Fence and Chains

Item No.	Part No.	Description	Notes
1	Ref	Paper Fence	475 and 500 lpm models and models with power stacker
2	Ref	Paper Tray Assembly	800, 900, 1000, 1200, 1400, and 1500 lpm models. (Not used on models with power stacker.)
3	153503-001	Grommet Kit, Cabinet	
4	153778-001	Chain Assembly Kit	
5	Ref	AC Power Cord	
6	Ref	Grommet, Power Cord (2)	Included in item 3
7	Ref	Rail, Stacker	Part of item 2
8	151831-001	Clip, Rail, Stacker	
9	Ref	Screw (4)	

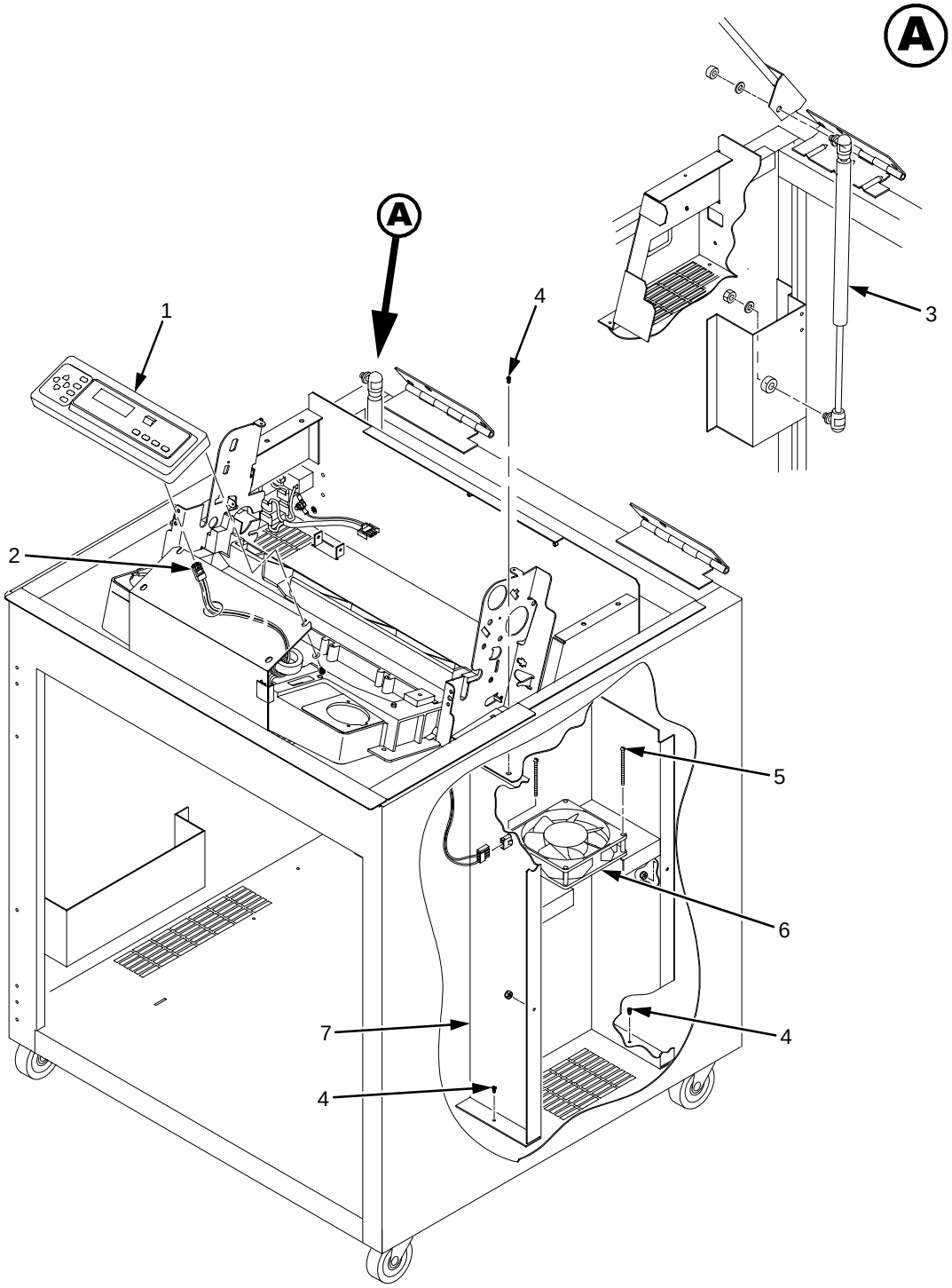


Figure 31. Control Panel and Cabinet Details

Item No.	Part No.	Description	Notes
1	153700-901	Control Panel Assembly	Includes mounting hardware
2	152440-901	Cable Assembly, Control Panel	Installed with shielding beads: See Appendix E
3	107961-905	Gas Spring Kit	Includes ball studs, spring clips, and mounting hardware
4	Ref	Screw, w/Lock Washer (2)	6-32x.375
5	Ref	Screw, w/Lock Washer (3)	6-32x2.00
6	150261-901	Fan Assembly	Includes mounting hardware
7	Ref	Duct, Air Exhaust	

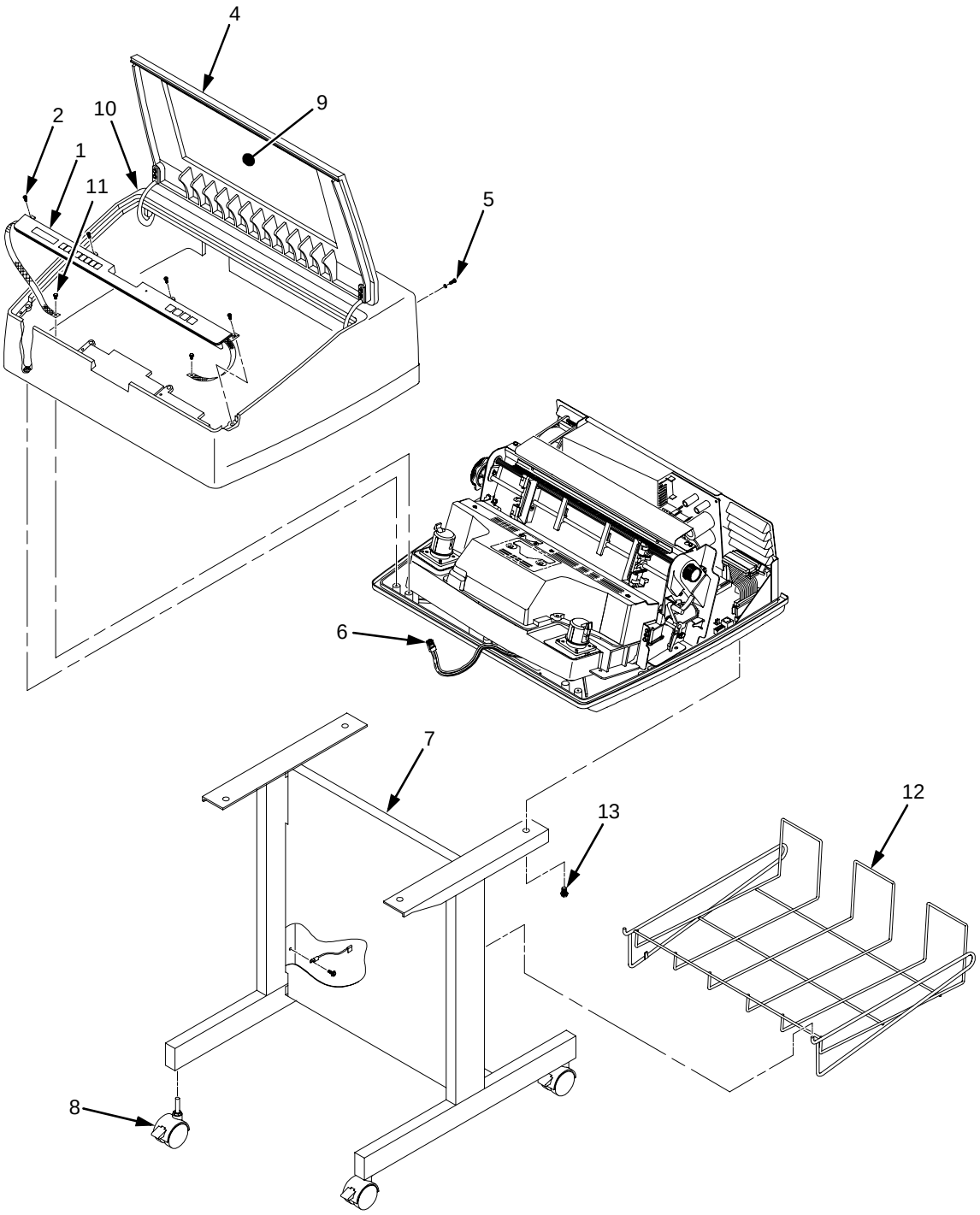


Figure 32. Pedestal Details

Item No.	Part No.	Description	Notes
1	153366-901	Control Panel Assembly	
2	Ref	Screw, Captive (4)	
3	Ref	Screw, Captive (2)	Part of item 10
4	Ref	Lid, Pedestal Model	Part of item 10
5	Ref	Screw (2)	
6	150440-901	Cable Assembly, Control Panel	
7	154288-002	Pedestal Kit w/Tray	
8	158635-001	Caster w/Brake, Pedestal (4)	
9	Ref	Window, Top Cover	Part of item 10
10	157337-901	Top Cover, Complete	
11	Ref	Screw (2)	Control panel ground strap
12	110718-001	Paper Tray	
13	Ref	Screw (4)	10-32x.625

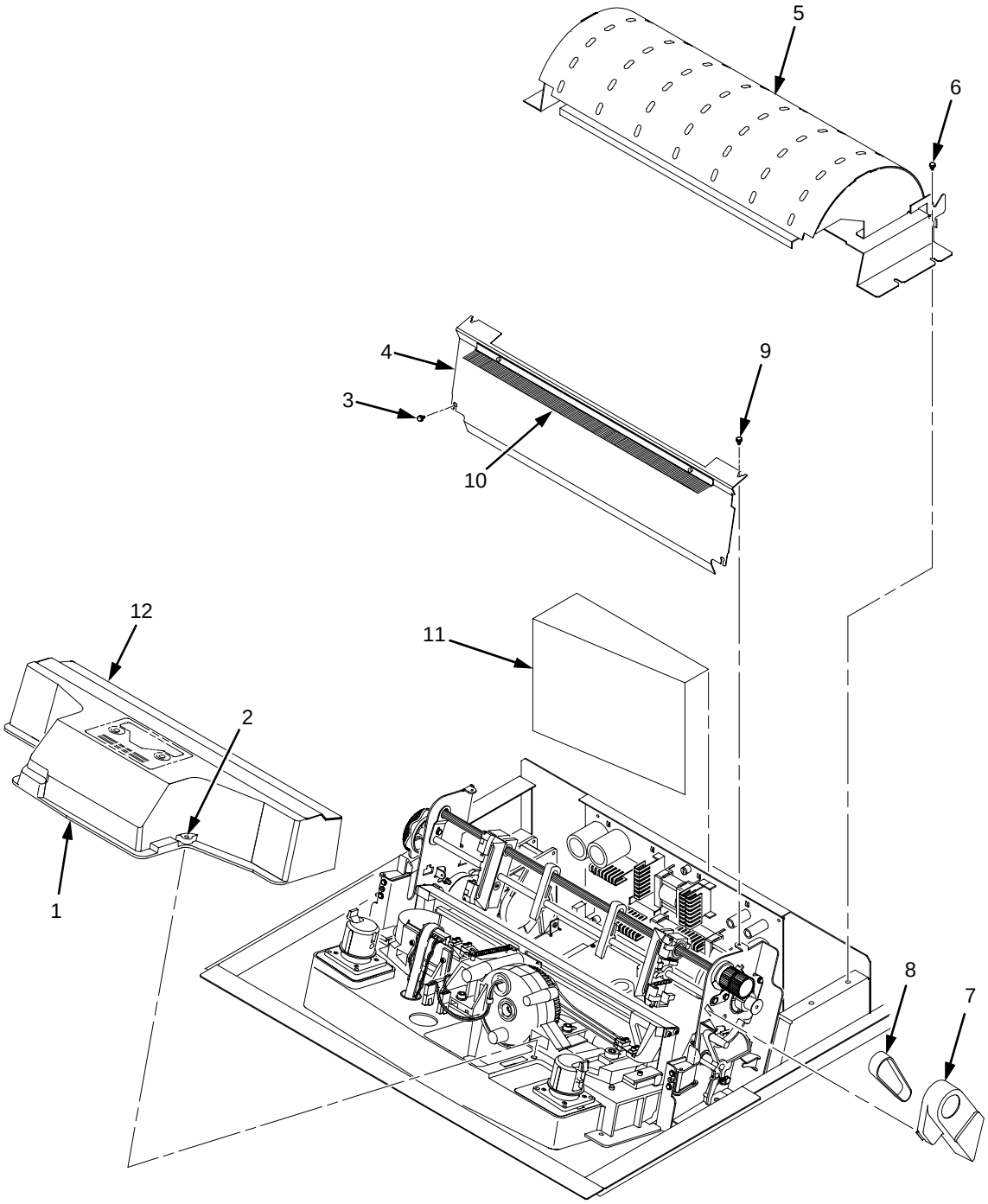


Figure 33. Inside Covers, Cabinet Models

Item No.	Part No.	Description	Notes
1	164295-001	Shuttle Cover	(Shroud Assembly, Air)
2	Ref	Screw, Captive (2)	10-24x.62 with O-ring, .125x.250x.06
3	Ref	Screw, Thread-forming (2)	6-32x.25 and #6 flat washer
4	Ref	Barrier Shield	
5	152290-901	Paper Path	
6	Ref	Screw, w/Lock Washer (3)	6-32.25 and #6 flat washer
7	153488-001	Platen/Paper Feed Cover Kit	Paper Feed Belt Cover shown
8	108664-903	Belt, Timing, .080 Pitch, 100 Teeth, .500 Wide	Paper Feed Belt
9	Ref	Screw, Thread-forming (2)	6-32x.25
10	152284-901	Anti-Static Brush Kit	
11	154073-001	Power Supply Shield	Taped to card cage along upper edge
12	153528-901	Paper Scale	

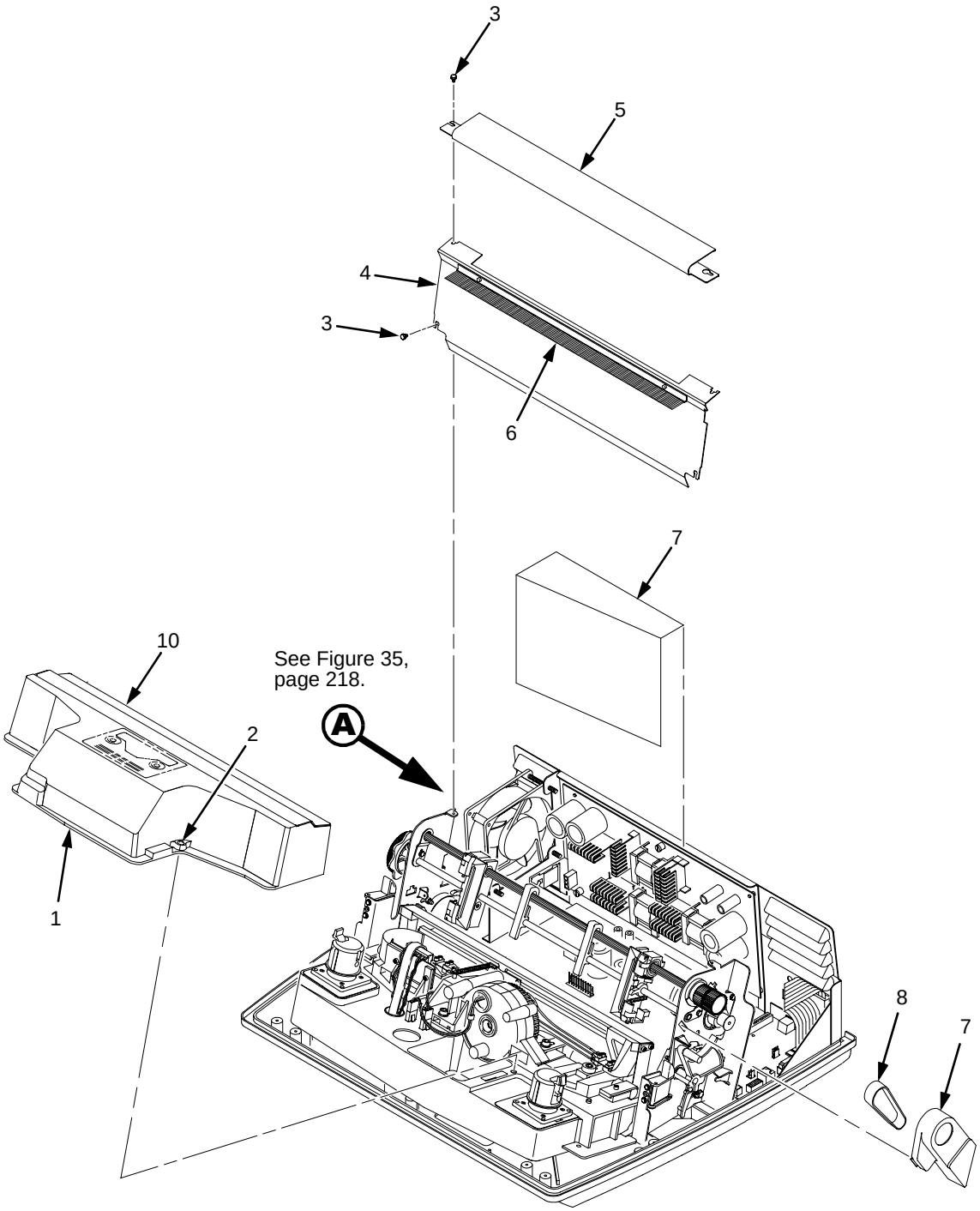


Figure 34. Inside Covers and Card Cage, Pedestal Models

Item No.	Part No.	Description	Notes
1	164295-001	Shuttle Cover	(Shroud Assembly, Air)
2	Ref	Screw, Captive (2)	10-24x.62 with O-ring, .125x.250x.06
3	Ref	Screw, Thread-forming (2)	6-32x.25 and #6 flat washer
4	Ref	Barrier Shield	
5	154286-001	Paper Path	
6	152284-901	Anti-Static Brush Kit	
7	154073-001	Power Supply Shield	Taped to card cage along upper edge
8	108664-903	Belt, Timing, .080 Pitch, 100 Teeth, .500 Wide	Paper Feed Belt
9	153488-001	Platen/Paper Feed Cover Kit	Paper Feed Belt Cover shown
10	153528-901	Paper Scale	

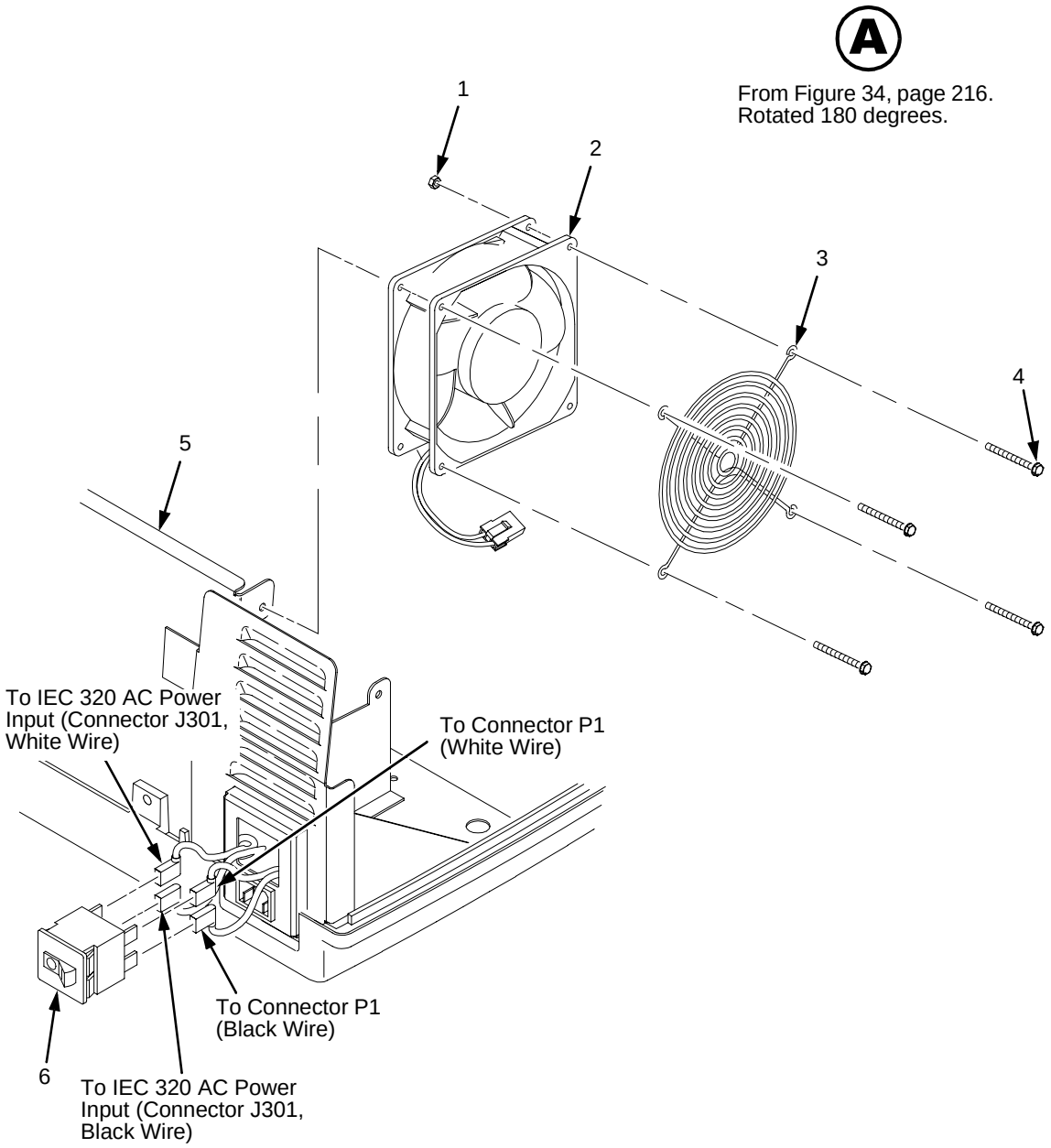


Figure 35. Card Cage Detail, Pedestal Models

Item No.	Part No.	Description	Notes
1	Ref	Nut, 6-32 (1)	Upper right fan corner only
2	150261-901	Card Cage Fan Assembly	Air flow is into card cage
3	Ref	Fan Guard	
4	Ref	Screw, w/Lock Washer (4)	6-32x1.75
5	Ref	Card Cage, Pedestal	
6	142013-901	Circuit Breaker	

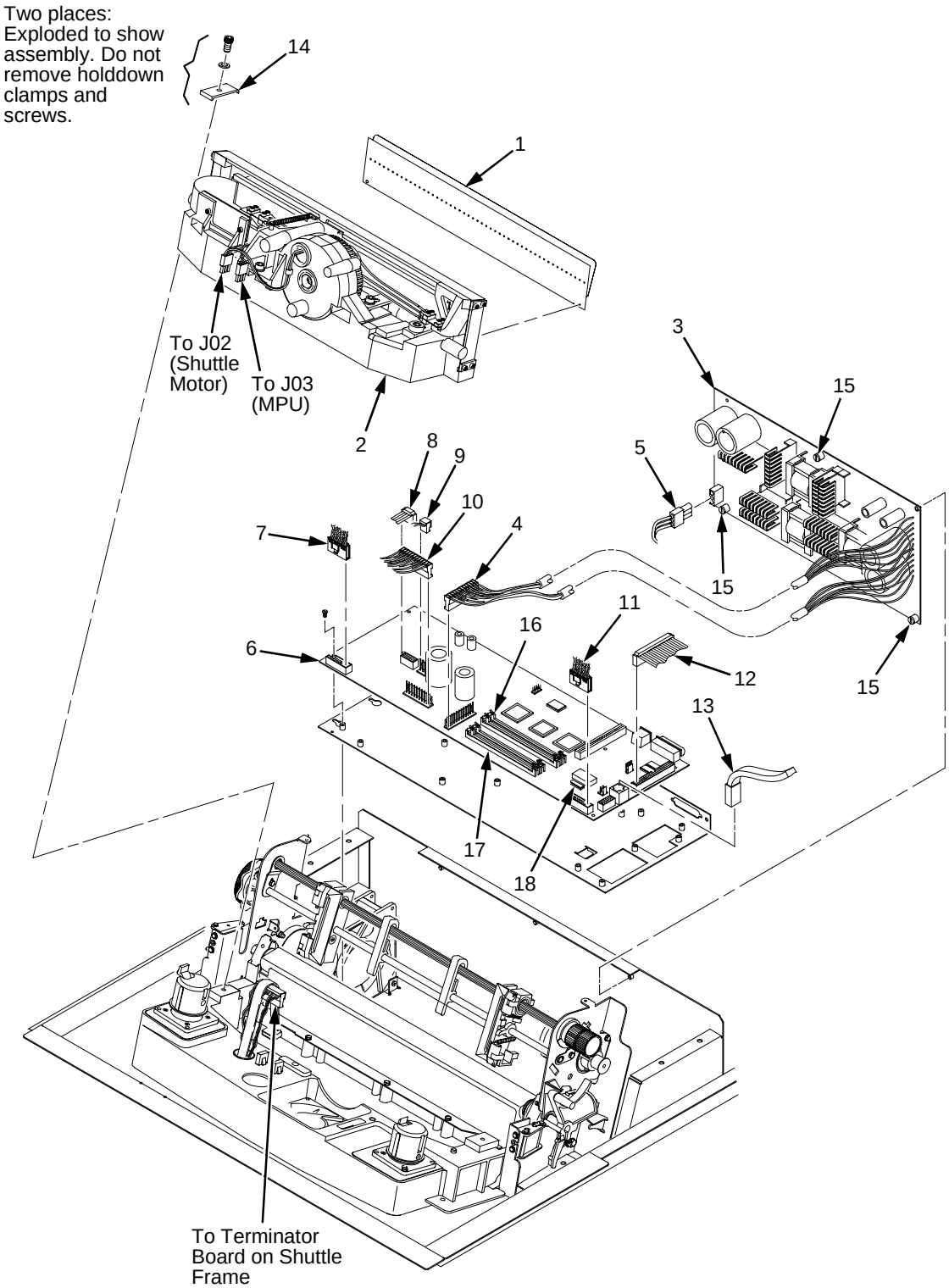


Figure 36. Print Mechanism and Circuit Boards: Early Models

Item No.	Part No.	Description	Notes
1	159766-901	Hammer Bank/Ribbon Mask Cover Assy	P5005(A), P5205(A)
	159767-901	Hammer Bank/Ribbon Mask Cover Assy	P5X08, P5X09
	159768-901	Hammer Bank/Ribbon Mask Cover Assy	P5212, P5214, P5XKA
2	153320-901	Shuttle Frame Assembly	P5X05 (475 lpm)
	155884-901	Shuttle Frame Assembly	P5X05-12 (475 lpm)
	158338-901	Shuttle Frame Assembly	P5X05A (500 lpm)
	159397-901	Shuttle Frame Assembly	P5X05A-12 (500 lpm)
	153276-901	Shuttle Frame Assembly	P5X08
	155888-901	Shuttle Frame Assembly	P5X08-12
	159925-901	Shuttle Frame Assembly	P5X09
	153321-901	Shuttle Frame Assembly	P5212
	157282-901	Shuttle Frame Assembly	P5214
	157722-901	Shuttle Frame Assembly	P5XKA (Kanji/Hanzi)
	153969-901	Hammer Spring Assembly	P5X05(A)
	155883-901	Hammer Spring Assembly	P5X05-12
	153970-901	Hammer Spring Assembly	P5X08
	155887-901	Hammer Spring Assembly	P5X08-12
	153459-901	Hammer Spring Assembly	P5X09
	153971-901	Hammer Spring Assembly	P5212, P5214
	157726-901	Hammer Spring Assembly	P5XKA
3	157102-901	Power Supply PCBA, V4	All models
4	Ref	P101 Cable Connector	
5	Ref	Cable Assembly, AC-In, Power Supply	Part of Field Kit, AC Assy, 153502-901
6	157450-901	Controller Board Assembly, CMX V5.5 40 MHz	All models
7	202362-901	Connector Kit (P106/P107)	P106, Motor Sensor, Left
8	Ref	Hammer Bank Logic Cable Assembly	
9	Ref	Shuttle Motor Cable Assembly	
10	Ref	Hammer Bank Power Cable Assembly	
11	202362-901	Connector Kit (P106/P107)	P107, Motor Sensor, Right
12	152439-901	Centronics I/O Cable Assembly	
13	Ref	Control Panel Cable Assembly	
14	150399-901	Clamp, Shaft, Receiving	
15	Ref	Screw, Captive, Power Supply (3)	
16	202417-001	SIMM, Flash Memory, 4 MB	
17	203142-001	SIMM, DRAM, 8 MB	
18	Ref	Security PAL	

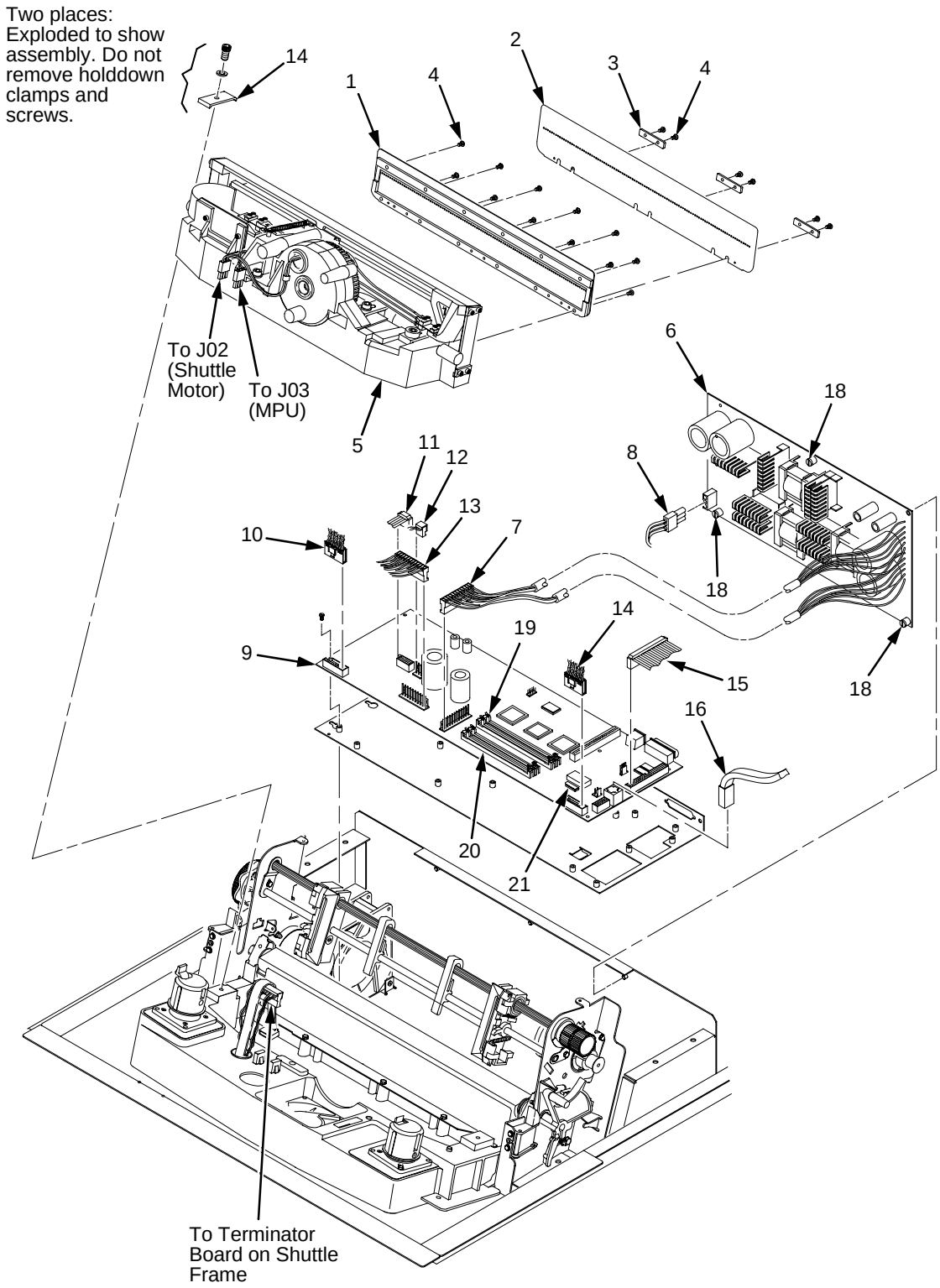


Figure 37. Print Mechanism and Circuit Boards: Later Models

Item No.	Part No.	Description	Notes
1	163802-901 163795-901 164216-901	Hammer Bank Cover Hammer Bank Cover Hammer Bank Cover	P5005B, P5205B P5010, P5210 P5015, P5215
2	163789-901 163797-901 164204-901	Ribbon Mask Ribbon Mask Ribbon Mask	P5005B, P5205B P5010, P5210 P5015, P5215
3	163812-901	Ribbon Mask Clamp Plate	
4	Ref	Screw, Torx T-10	12 for hammer bank cover 6 for ribbon mask
5	163984-901 164366-901 163985-901 157735-901 164266-901 155883-901 164267-901 164269-901	Shuttle Frame Assembly Shuttle Frame Assembly Shuttle Frame Assembly Shuttle Frame Assembly Hammer Spring Assembly Field Kit Hammer Spring Assembly Field Kit Hammer Spring Assembly Field Kit Hammer Spring Assembly Field Kit	P5X05B (500 lpm) P5X05B-12 (500 lpm) P5X10 P5X15 P5X05B P5X05B-12 P5X10 P5X15
6	157102-901	Power Supply PCBA, V4	
7	Ref	P101 Cable Connector	
8	Ref	Cable Assembly, AC-In, Power Supply	Part of Field Kit, AC Assy, 153502-901
9	157450-901	Controller Board Assembly, CMX V5.5 40 MHz	
10	202362-901	Connector Kit (P106/P107)	P106, Motor Sensor, Left
11	Ref	Hammer Bank Logic Cable Assembly	
12	Ref	Shuttle Motor Cable Assembly	
13	Ref	Hammer Bank Power Cable Assembly	
14	202362-901	Connector Kit (P106/P107)	P107, Motor Sensor, Right
15	152439-901	Centronics I/O Cable Assembly	
16	Ref	Control Panel Cable Assembly	
17	150399-901	Clamp, Shaft, Receiving	
18	Ref	Screw, Captive, Power Supply (3)	
19	202417-001	SIMM, Flash Memory, 4 MB	
20	203142-001	SIMM, DRAM, 8 MB	
21	Ref	Security PAL	

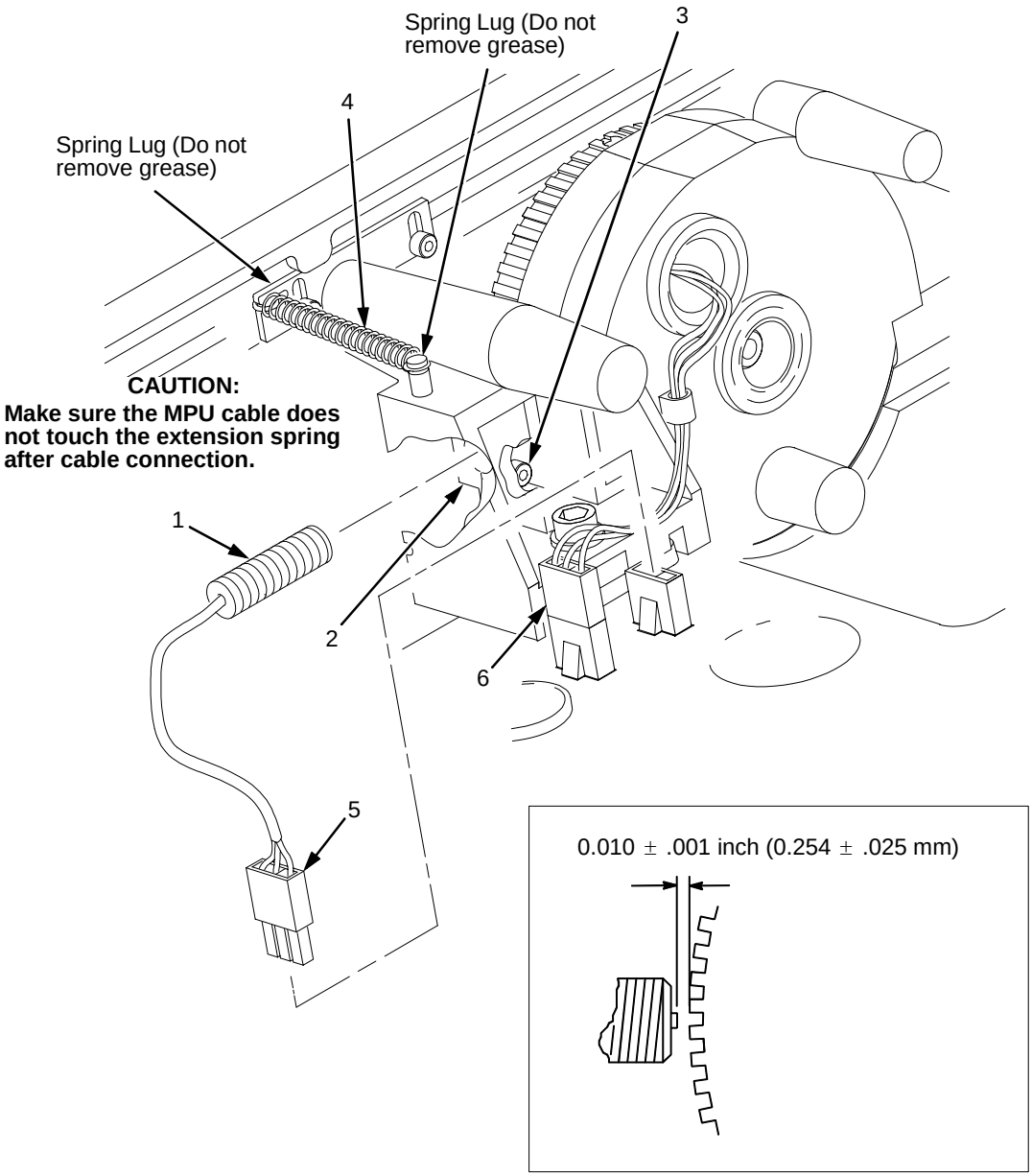
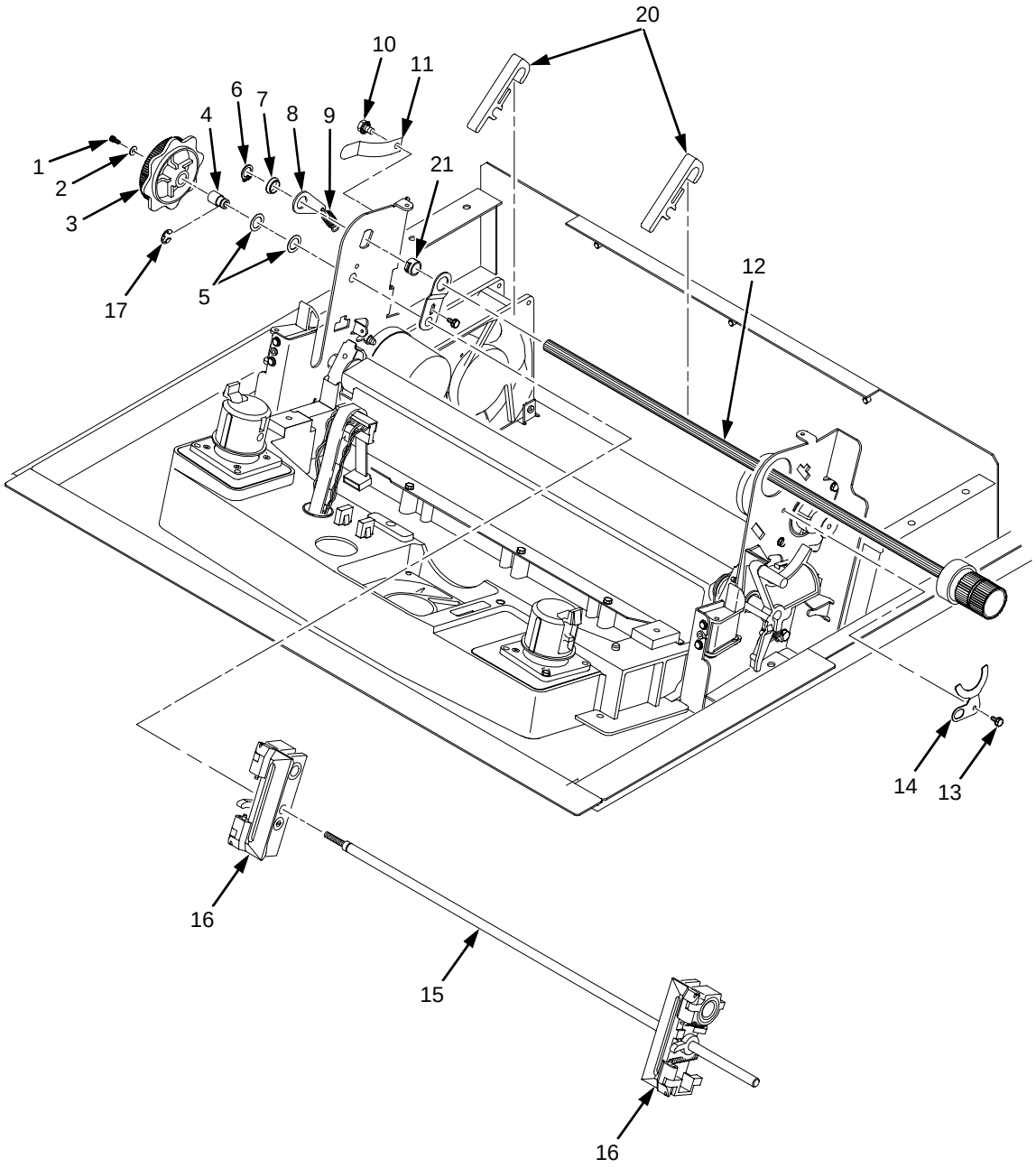


Figure 38. Magnetic Pickup (MPU) and Extension Spring

Item No.	Part No.	Description	Notes
1	150281-901	MPU Assembly	
2	Ref	Bracket, MPU	Part of item 1
3	Ref	Screw, Socket Cap	6-32x.38
4	153537-901	Extension Spring	
5	Ref	MPU Cable Connector (P03)	
6	Ref	Shuttle Motor Cable Connector	



NOTE
Item 18 (not shown): Tractor Shaft Hardware Kit, includes items 6, 7, 8, 9, 13, 14, and 21
Item 19 (not shown): Tractor Shaft Kit, includes items 1, 2, 3, 4, 5, 15, and 17

Figure 39. Tractor Shafts

Item No.	Part No.	Description	Notes
1	Ref	Screw, Socket Cap	Part of item 19
2	Ref	Washer, Flat #4	Part of item 19
3	Ref	Knob, Tractor Adjust	Part of item 19
4	Ref	Bushing, Tractor Adjust	Part of item 19
5	Ref	Washer, Curved Spring (2)	Part of item 19
6	Ref	Ring, Grip	Part of item 18
7	Ref	Bearing, Nylon .626	Part of item 18
8	Ref	Link, Spring	Part of item 18
9	Ref	Spring, Extension 1.00L	Part of item 18
10	Ref	Screw, Hex w/Lock Washer, 4-20x.50	Part of item 11
11	150784-901	Clip, Grounding	
12	150491-901	Splined Shaft Assembly	
13	Ref	Screw, Thread-forming	Part of item 18
14	Ref	Clamp, Bearing	Part of item 18
15	Ref	Tractor Shaft	Part of item 19
16	140716-903 158741-001	Tractor Set, RH & LH Tractor Assembly, Power Stacker, P5XXX	 Used with power stacker
17	Ref	E-Ring	Part of item 19
18	153540-001	Tractor Shaft Hardware Kit	Includes items 6, 7, 8, 9, 13, 14, and 21
19	153431-001	Tractor Shaft Kit	Includes items 1, 2, 3, 4, 5, 15, and 17
20	155182-901	Paper Support	
21	Ref	Bushing	Part of item 18

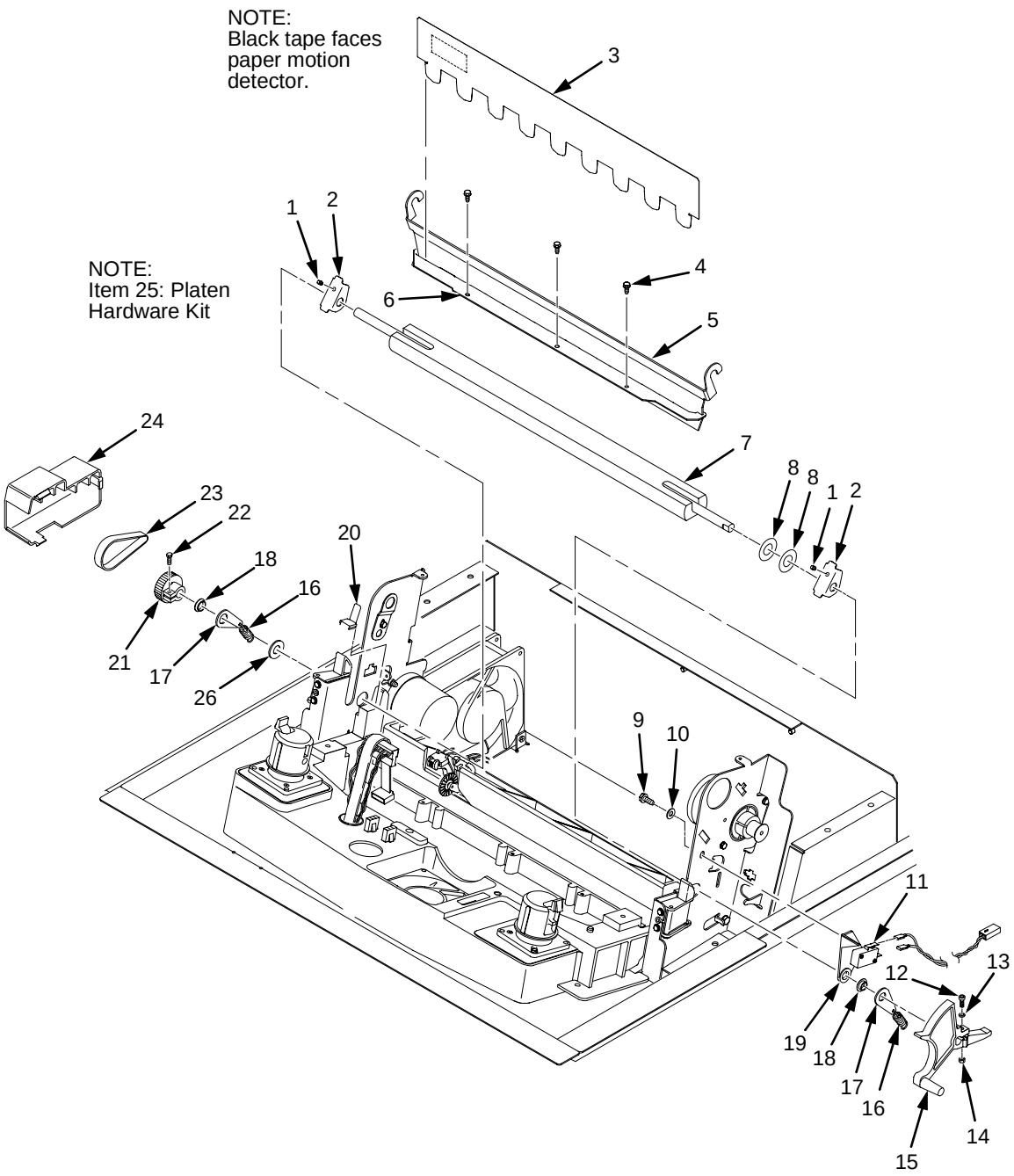


Figure 40. Platen

Item No.	Part No.	Description	Notes
1	Ref	Setscrew (2)	Part of item 25
2	Ref	Bracket, Platen (2)	Part of item 25
3	150957-901	Ironer, Paper	
4	Ref	Screw, Thread-forming (3)	6-32x.25
5	Ref	Bracket, Ironer	
6	Ref	Plate, Ironer	
7	112657-901	Platen Assembly	
8	Ref	Washer, Flat (2)	Part of item 25
9	Ref	Screw (2)	Part of item 11
10	Ref	Washer, Flat #4 (2)	Part of item 11
11	152417-901	Platen Switch Kit	Includes items 9, 10, 19
12	Ref	Screw, Socket Cap, 6-32x.75	Part of item 15
13	Ref	Washer	Part of item 15
14	Ref	Nut	Part of item 15
15	154650-001	Platen Lever Kit	Includes items 12, 13, 14
16	Ref	Spring, Extension 1.12L	Part of item 25
17	Ref	Link, Spring	Part of item 25
18	Ref	Bearing, Nylon .376	Part of item 25
19	Ref	Bracket, Switch Mount	Part of item 11
20	Ref	Wear Saddle, Platen (2)	Part of item 25
21	150703-902	Platen Pulley, Drive	
22	Ref	Screw, Socket Cap, 6-32x.44	Part of item 21
23	141516-901	Belt, Timing, .080 Pitch, .312 Wide	Platen Open Belt
24	153488-001	Platen/Paper Feed Cover Kit	Platen Open Belt Cover shown
25	153430-001	Platen Hardware Kit	Includes items 1, 2, 8, 16, 17, 18, 20, 26
26	Ref	Platen Washer	Part of item 25

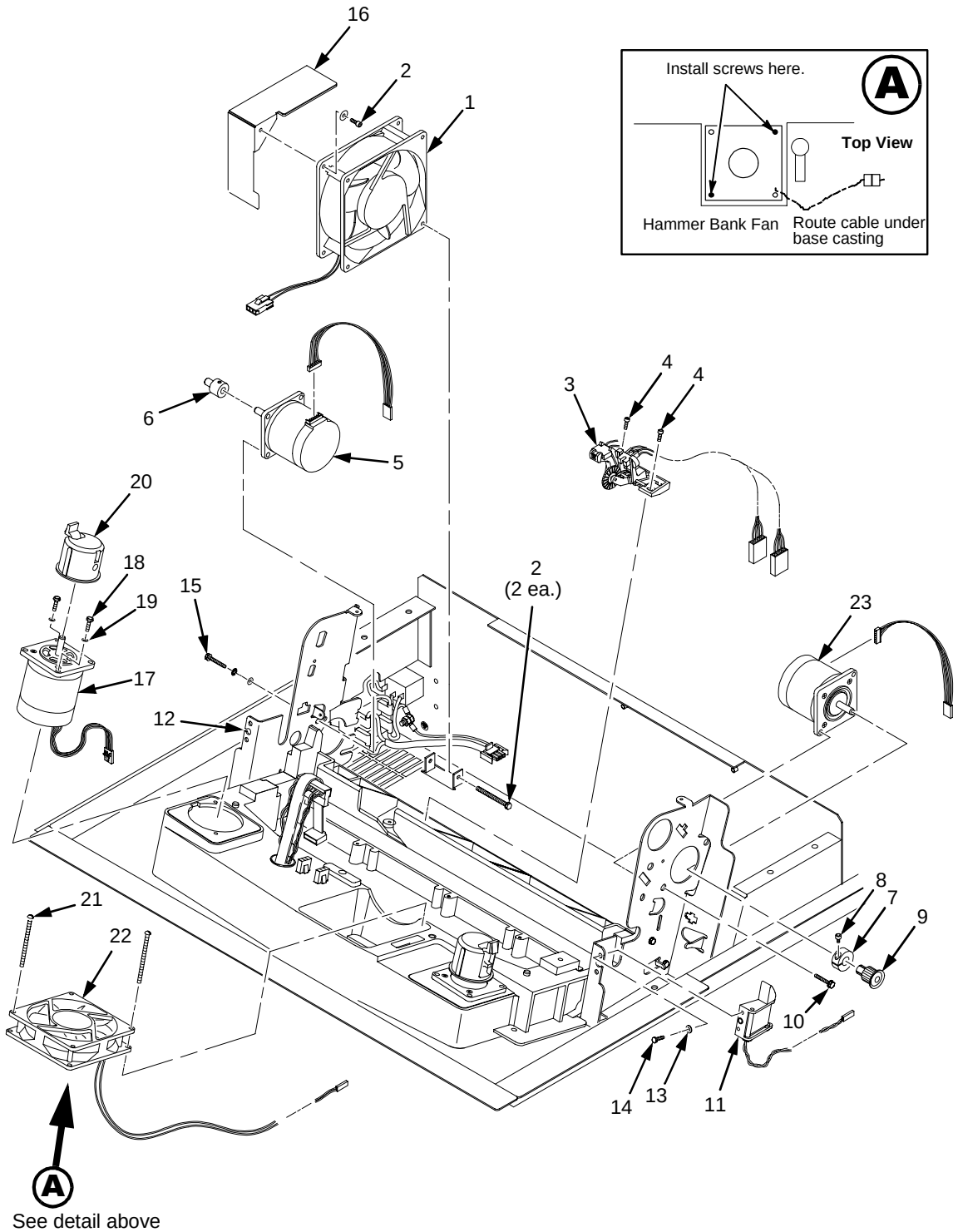


Figure 41. Motors, Fans, and Paper Detector Switch

Item No.	Part No.	Description	Notes
1	150261-901	Card Cage Fan Assembly	Air flow is into card cage
2	Ref	Screw, w/Lock Washer (3)	Two 6-32x1.75 on bottom, One 6-32x0.50 on top left
3	152415-901	Switch Assembly, Paper Detector	
4	Ref	Screw, Thread-forming, 6-32x.375 (2)	Part of item 3
5	152299-901	Motor Assembly, Platen	
6	155071-902	Platen Pulley, Drive Motor	With setscrew: 6-32x.25
7	Ref	Collar, Shaft	Part of item 9
8	Ref	Setscrew, 6-32x.51	Part of item 7
9	108627-901	Pulley, Paper Feed	
10	Ref	Screw, Hex w/Lock Washer, 10-24x.50 (2)	Part of item 23
11	163597-901	Ribbon Guide Kit	
12	Ref	Ribbon Guide Kit	Same as item 11
13	Ref	Washer, Flat #4	Part of item 12
14	Ref	Screw, w/Lock Washer, 4-40x.38	Part of item 12
15	Ref	Screw, w/Lock Washer, 10-32x.50 (2)	Part of item 5
16	Ref	Shield, Card Cage Fan	
17	154071-901	Motor Assembly, Ribbon	
18	Ref	Screw, Hex w/Lock Washer (2)	6-32x.50
19	Ref	Washer, Flat #6 (2)	
20	150868-001	Ribbon Hub Kit	
21	Ref	Screw, w/Lock Washer (2)	6-32x1.25
22	152416-901	Hammer Bank Fan Assembly	Air flow is up
23	154068-901	Motor Assembly, Paper Feed	

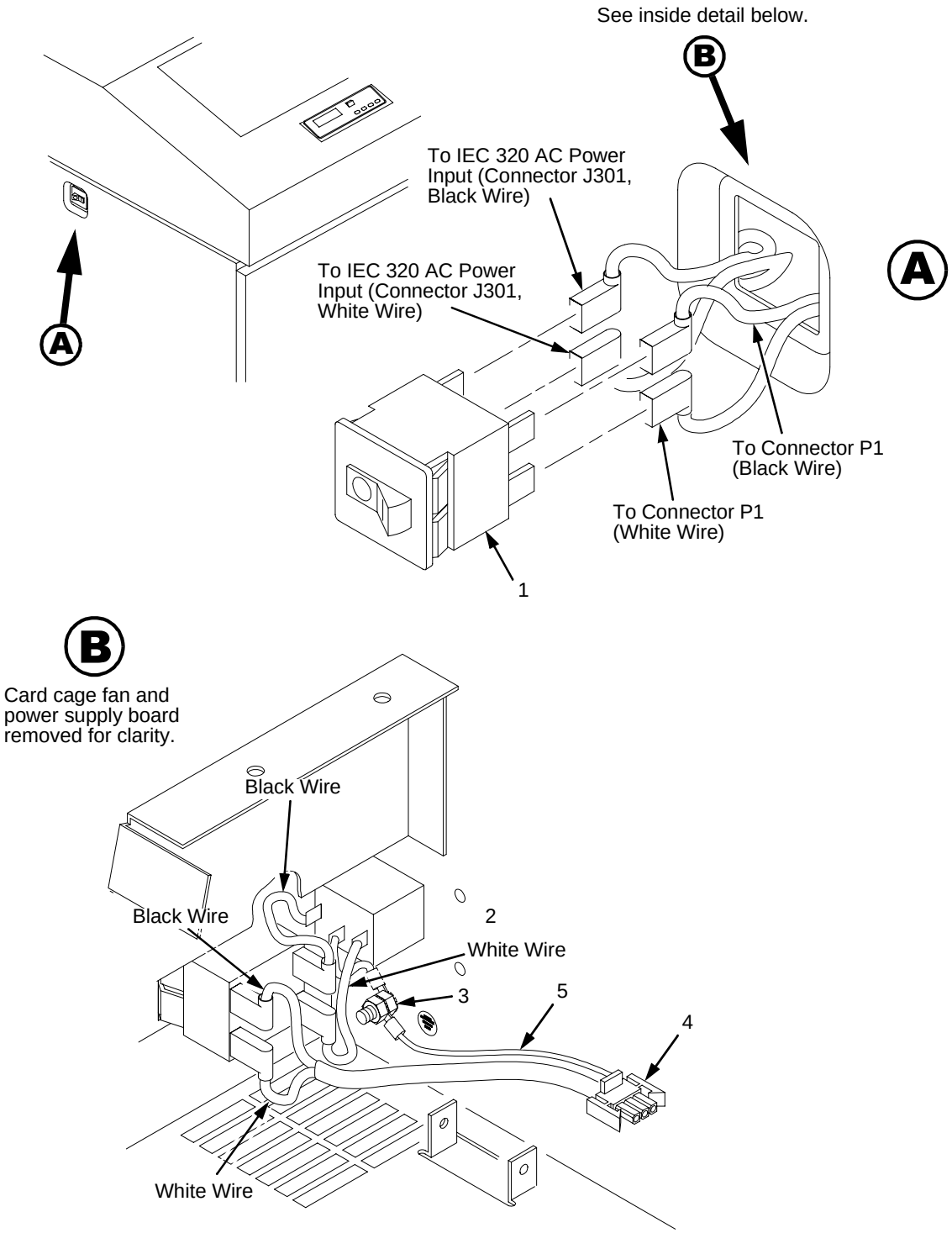


Figure 42. Circuit Breaker, Cabinet Models

Item No.	Part No.	Description	Notes
1	142013-901	Circuit Breaker	
2	Ref	IEC 320 AC Power Connector	Connector J301
3	Ref	Chassis Ground Stud	
4	Ref	Connector P1	To power supply board connector J1 AC
5	Ref	Cable Assembly, AC-In, Power Supply	Part of Field Kit, AC Assy 153502-901

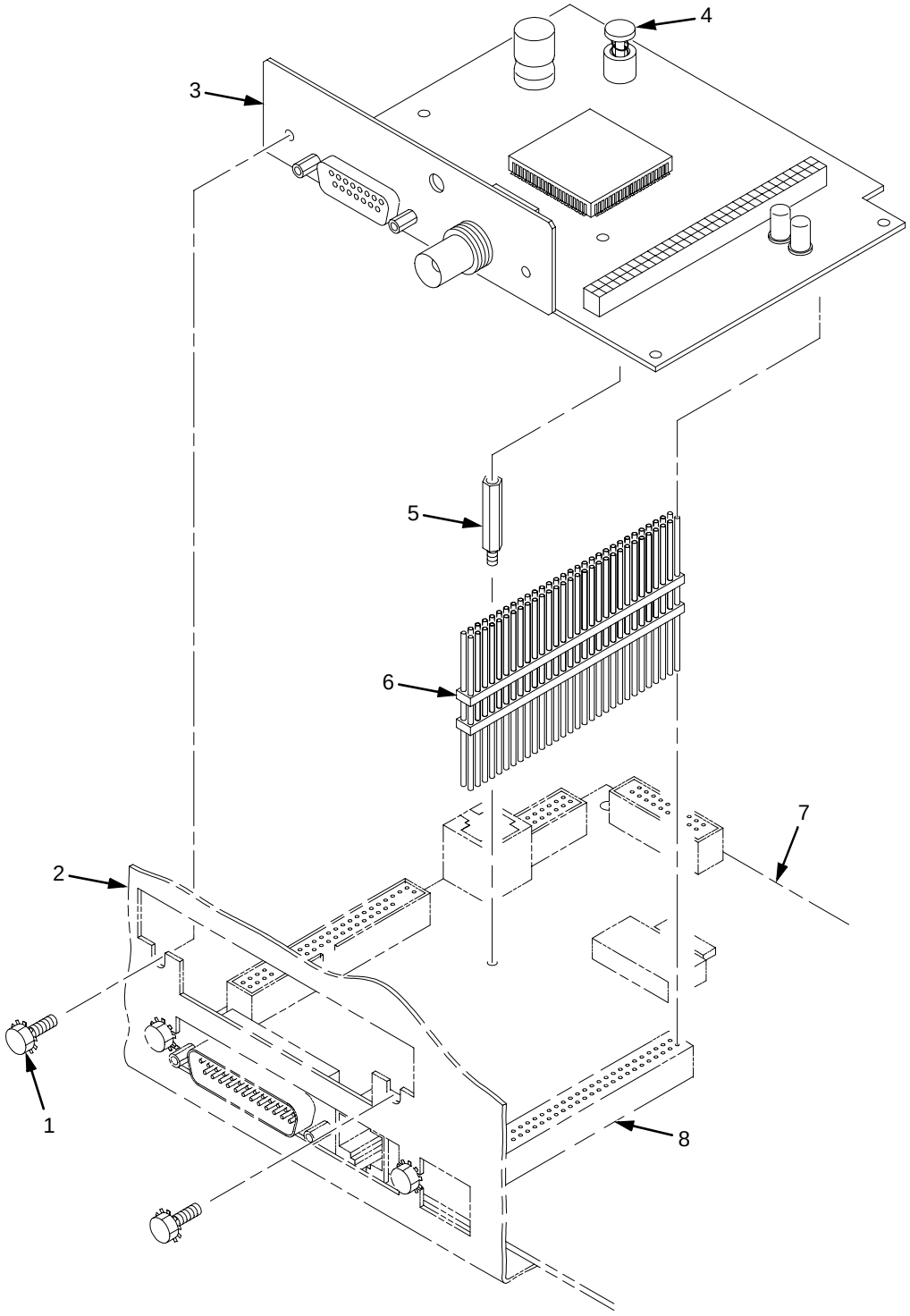


Figure 43. Expansion-CT Board

Item No.	Part No.	Description	Notes
1	Ref	Screw (2)	
2	Ref	Card Cage	
3	156075-001	Expansion-CT Subassembly	
4	Ref	Screw, Captive	Part of item 3
5	Ref	Standoff, Hex, 3/16 inch, M/F, .813 Lg	Part of item 3
6	Ref	Adapter, Expansion Connector, 60-pin	Part of item 3
7	Ref	CMX Controller Board	
8	Ref	Controller Board Connector J111	

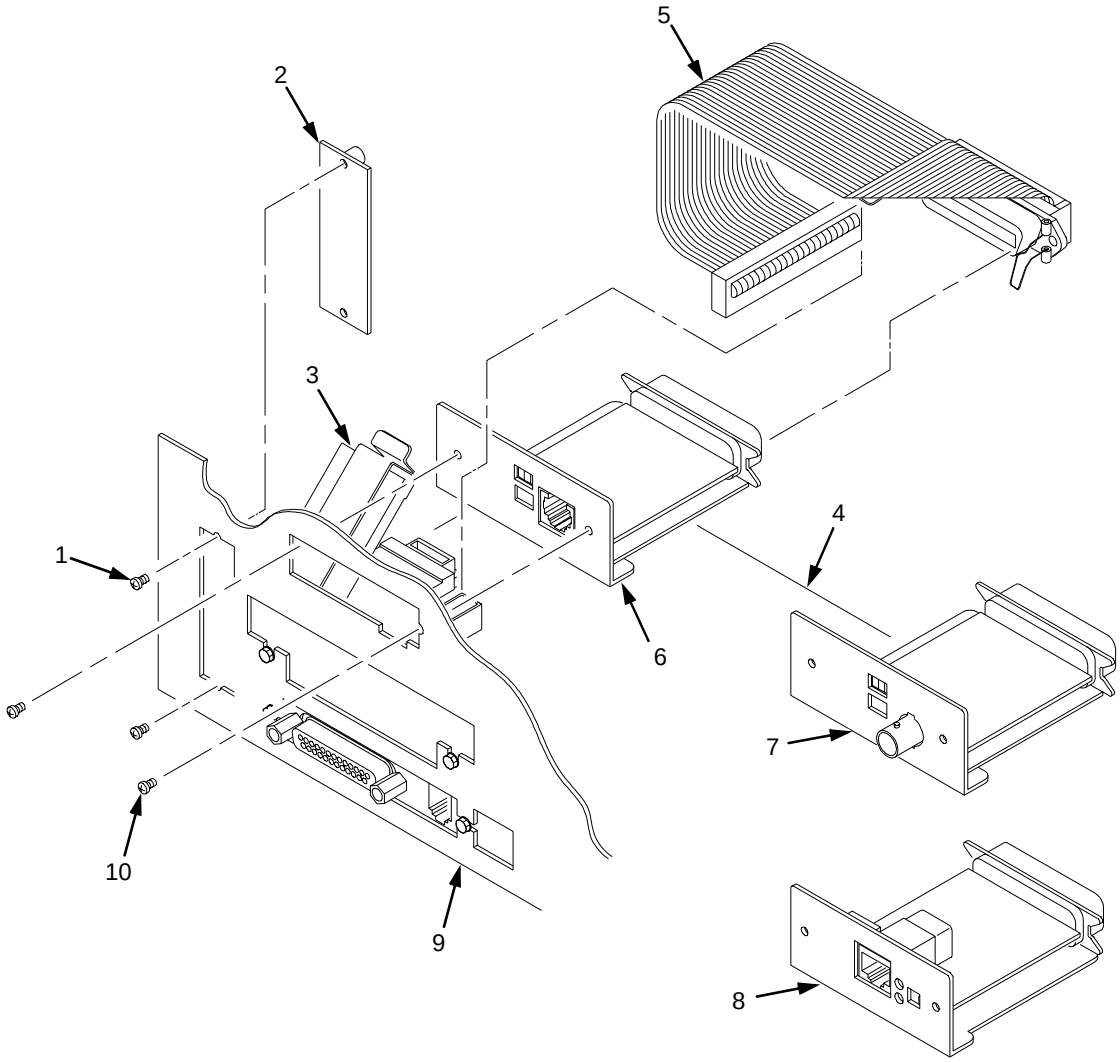


Figure 44. PrintNet Ethernet Interface Assemblies

Item No.	Part No.	Description	Notes
1	Ref	Screw, Connector Cover (2)	
2	158295-001	Cover Plate, Centronics	
3	202049-001	Ferrite Clamp	See Appendix E
4	Ref	CMX Controller Board	
5	152439-901	Centronics I/O Cable Assembly	
6	163220-001 163221-001	Interface Kit, Dist, LAN 10Base-T Field Kit, Dist, LAN 10Base-T	PrintNet factory installed PrintNet field kit
7	163222-001 163223-001	Interface Kit, Dist, LAN 10Base2 Field Kit, Dist, LAN 10Base2	PrintNet factory installed PrintNet field kit
8	170593-001 170613-001	Interface Kit, Dist, LAN 100Base-T Interface Kit, Dist, LAN 100Base-T	PrintNet factory installed PrintNet field kit
9	Ref	Rear of Card Cage	
10	Ref	Screw (2)	

6 *Principles of Operation*

Line Matrix Printing

The printer creates characters and graphics by printing patterns of ink dots an entire line at a time. This technique is called line matrix printing.

Every text character is stored in printer memory as a pattern of dots on a logical grid called the dot matrix. (See Figure 45.) The ink dots are made by a row of small hammers mounted on a shuttle that sweeps rapidly back and forth. Logic circuits divide every line of incoming data into horizontal dot rows. The hammers put dots at the required positions for the entire line by striking an inked ribbon and the paper.

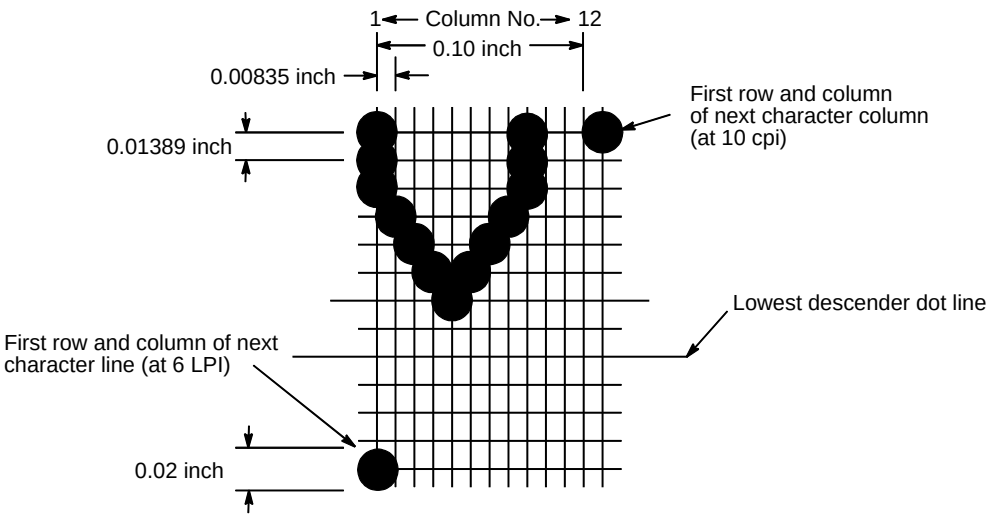


Figure 45. A Dot Matrix

When the shuttle reaches the end of a sweep, it reverses direction, the paper is advanced one dot row, and the hammers print the next row of dots as the shuttle sweeps in the opposite direction. After a line of characters is printed, hammer action stops and the paper advances to the first dot row of the next print line. The number of dot rows allowed for line separation depends on the vertical line spacing the user selects.

The dot matrix patterns of text characters vary according to the font the user selects. For example, in the data processing (DP) font at a line spacing of six lines per inch (lpi), a dot matrix contains 12 dot rows from the top of one character line to the top of the next. (See Figure 45 and Figure 46.) At eight lpi there are nine dot rows per character line, at nine lpi there are eight dot rows per character line, and so on.

Each individual hammer spring forms more than one character as the shuttle moves horizontally. This principle is illustrated in Figure 47.

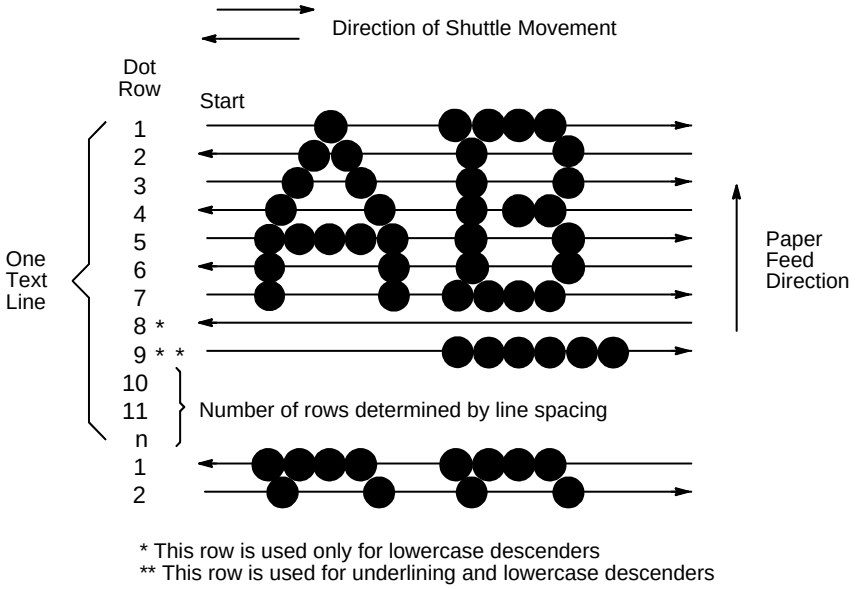


Figure 46. Standard Character Formation

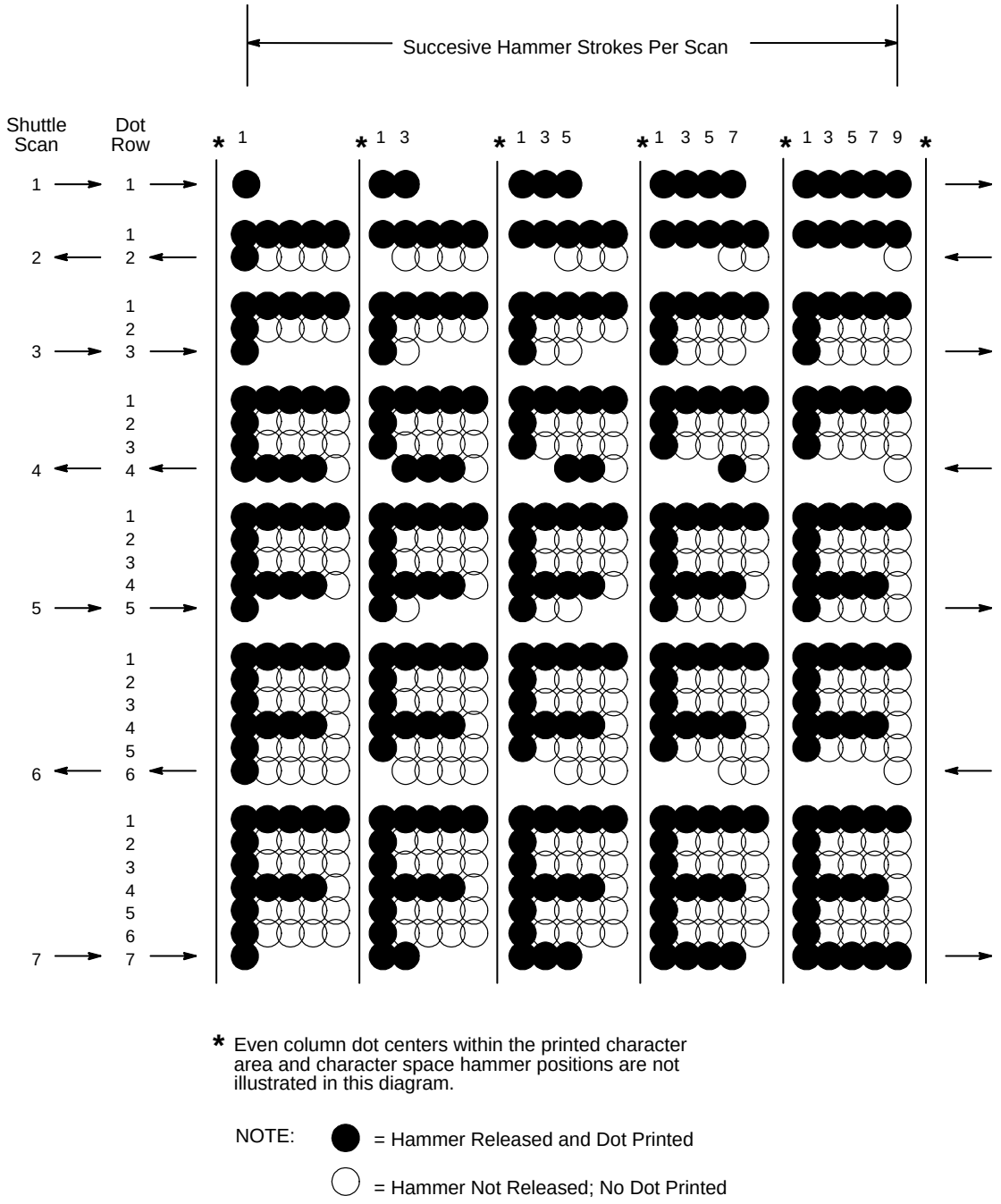


Figure 47. Action of One Hammer Spring in Text Printing

Printing Rates

Because a line matrix printer prints entire lines sequentially, it is faster than a moving-printhead printer, which prints single characters sequentially. The printing speed of text is measured in lines per minute (lpm) rather than characters per minute (cpm).

Many variables affect printing speed, the main ones being the selected font and the vertical dot density. Lines containing attributes such as bold or emphasized print, superscripts, subscripts, or elongated characters also reduce print speed to never less than half the rates of lines without such attributes. The actual print rate of lines containing these attributes depends on the specific print job, but software maximizes the throughput by dynamically determining which dot rows contain adjacent dots and must be printed in two strokes. Printing speed is not affected by the number of characters in a character set.

The printing speed of graphics (“plot mode”) is expressed in inches per minute (ipm).

The ability of the printer to feed paper downwards as well as upwards allows the printing of multiple densities on a single line. This is useful for printing forms and text together or for mixing fonts on the same print line. Use of multiple densities and reverse paper feed also affects throughput.

Printing Mechanism

While the principles of line matrix printing are easy to state, the act of printing dots accurately from a rapidly oscillating shuttle onto a piece of paper moving vertically requires complex timing and coordination between printer logic and the printing mechanism.

The printing mechanism consists of three integrated subassemblies:

- **Shuttle Frame Assembly**
- **Ribbon Transport System**
- **Paper Transport System**.

Shuttle Frame Assembly

The central element of the printing mechanism is the shuttle frame assembly, which houses the hammer bank assembly and the shuttle drive motor. (See Figure 48.)

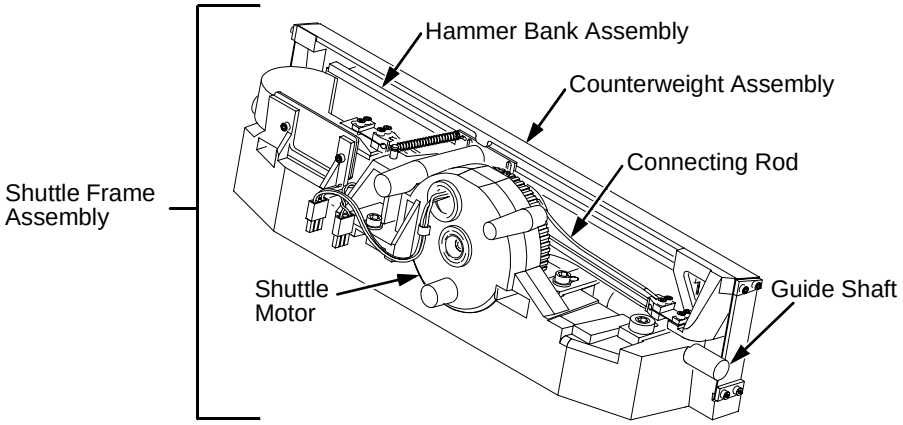


Figure 48. Shuttle Frame Assembly

Hammer Bank Assembly

The hammer springs are grouped in comb-like assemblies mounted on a solid hammer bank. Both the number of hammer springs per hammer spring assembly and the number of hammer spring assemblies on the hammer bank vary according to printer model:

- P5X05, P5X05A, and P5X05B printers have seven 4-hammer assemblies, for a total of 28 hammer springs.
- P5X08, P5X09 printers have seven 7-hammer assemblies, for a total of 49 hammer springs.
- P5X10 printers have six 10-hammer assemblies, for a total of 60 hammer springs.
- P5212, P5214, and P5XKA printers have seven 13-hammer assemblies, for a total of 91 hammer springs.
- P5X15 printers have six 17-hammer assemblies, for a total of 102 hammer springs.

Shuttle Drive Motor

The shuttle drive motor is built into the shuttle assembly casting and drives two connecting rods on a crankshaft. The small end of one connecting rod attaches to the hammer bank; the small end of the other connecting rod attaches to a counterweight frame surrounding the hammer bank. (The hammer bank and the counterweight constitute the shuttle assembly.) The rotary motion of the shuttle drive motor converts to linear and opposing motion of the hammer bank assembly and counterweight, in an arrangement

similar to that of a horizontally-opposed gasoline engine. Mechanically, this design achieves the same benefits as this type of engine: perfect primary balance, low vibration, and durability.

Each hammer spring is a stiff leaf spring with a cylindrical tungsten carbide tip on the free end. (See Figure 49.) A permanent magnet is imbedded along the length of the hammer bank and acts on the hammer springs through individual pole pieces. The pole pieces magnetically attract and hold the free end of the hammer spring under tension. This is called the retracted state.

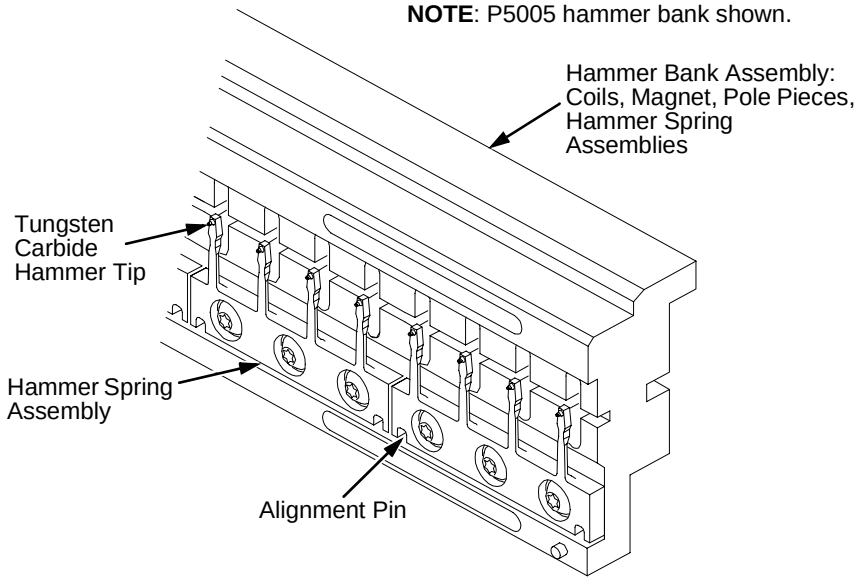

NOTE: P5005 hammer bank shown.
Hammer Bank Assembly: Coils, Magnet, Pole Pieces, Hammer Spring Assemblies
Tungsten Carbide Hammer Tip
Hammer Spring Assembly
Alignment Pin

Figure 49. Hammer Springs and Hammer Bank (Detail)

Two electromagnetic coils are mounted behind each hammer and wound around each pole piece. The coils are normally de-energized. When hammer driver logic determines that a hammer must print a dot, a current pulse energizes the coils behind it. The polarity of the resulting magnetic field opposes the field of the permanent magnet, canceling its effect and releasing the hammer. The hammer springs forward, strikes the ribbon and paper, and leaves an impression of its tip (a “dot”) on the paper.

While the hammer is in flight the coils are de-energized and their magnetic field collapses. After striking the ribbon and paper, the hammer rebounds and the permanent magnet recaptures it. When the shuttle reaches the end of a sweep, it reverses direction, the paper is moved up one dot row, and the hammer springs print the next row of dots as the shuttle sweeps in the opposite direction.

Paper Transport System

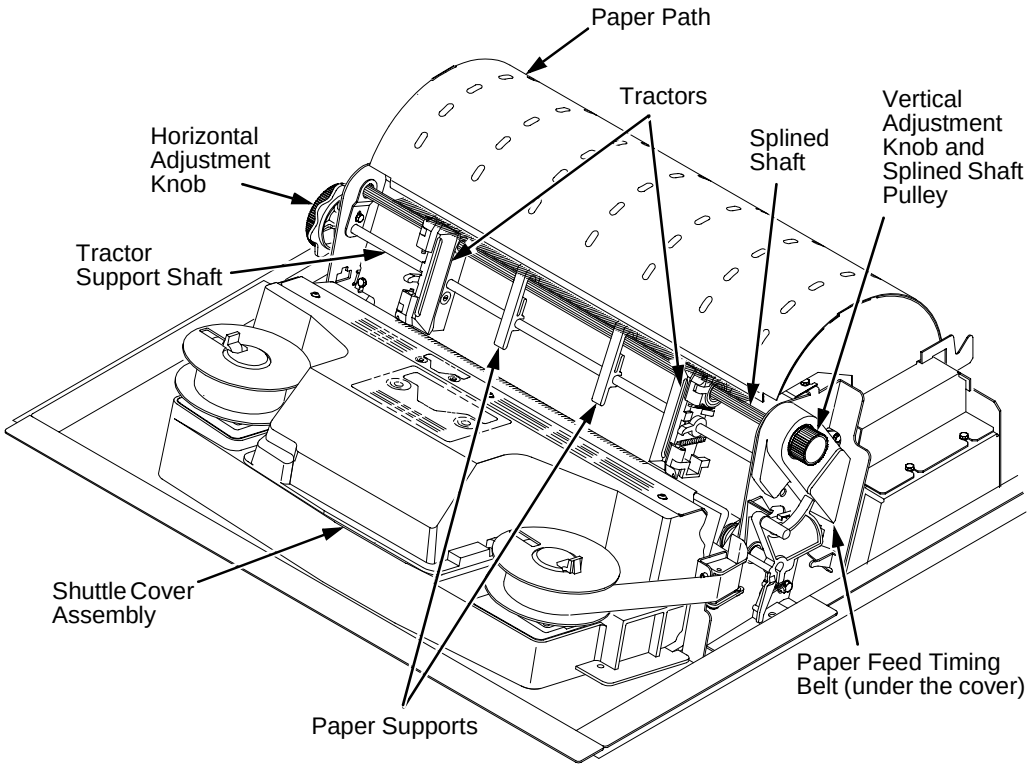


Figure 50. Paper Transport System

A two-phase DC stepper motor, directed by the engine controller (EC), drives two tractor sprockets by means of a toothed belt and splined shaft pulley. The stepper motor permits extremely accurate incremental vertical paper movement. This drive configuration is designed for continuous, fan-folded paper three to 17 inches wide and one to six sheets thick. For reverse paper feeding, the platen motor opens and closes the platen via a toothed belt. Opening the platen prevents paper jams when paper direction is reversed (moved downwards) after viewing the print area, setting top of form, or allowing applications to overprint forms.

Paper is positioned horizontally using the tractors and the horizontal adjustment knob. Each tractor is locked in position with a friction lock and engages the paper perforations with six sprocket pins. The horizontal adjustment knob allows vernier positioning of the left print margin.

The vertical adjustment knob is used to position paper vertically by hand.

Ribbon Transport System

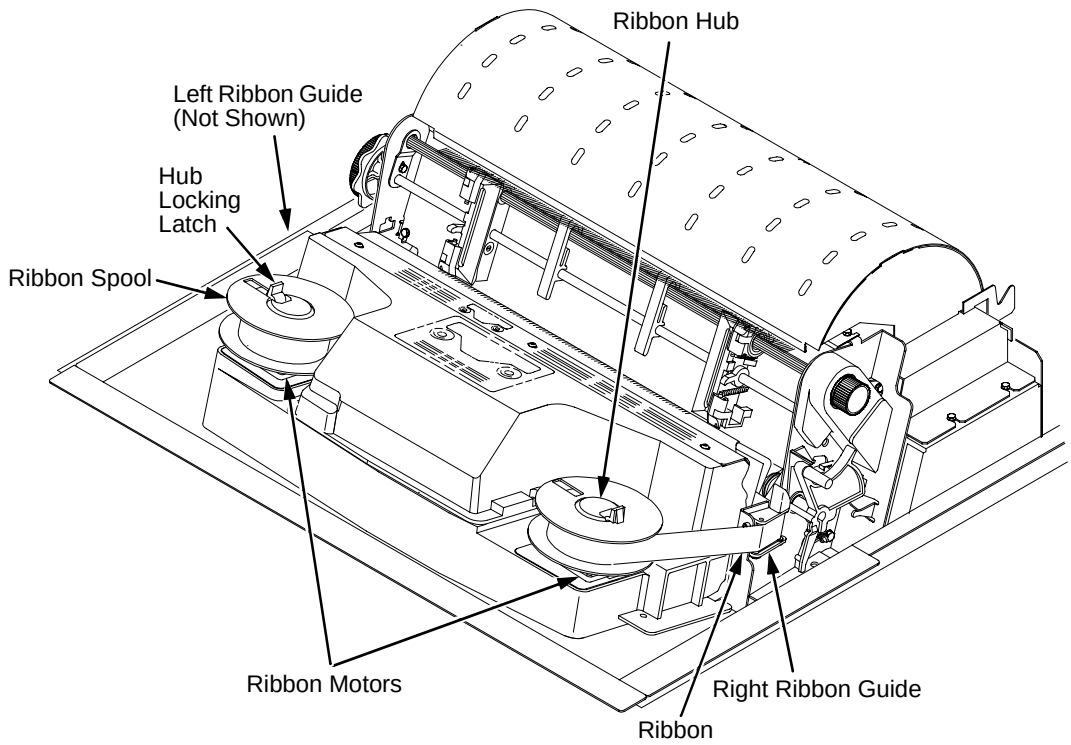


Figure 51. Ribbon Transport System

An inked ribbon winds and unwinds continuously on a pair of spools latched to hubs that are driven by the ribbon motors. The hubs and spools are offset vertically to equalize ribbon wear and prolong ribbon life. The ribbon motors operate only when the shuttle assembly is moving. Ribbon motion reverses when a metal strip at either end of the ribbon crosses the left or right ribbon guide, completing a circuit that causes both motors to reverse direction.

Constant ribbon tension is maintained by controlling each motor with a drive and a drag circuit. While the shuttle assembly is in motion, one motor acts as a drive motor, pulling the ribbon against the resistance exerted by the other motor—the drag motor. This system maintains constant motor speed and ribbon tension.

Logical Control of the Printer

The printer comprises four functional elements: the control panel, the CMX controller board, the power supply board, and the print mechanism. See Figure 52.

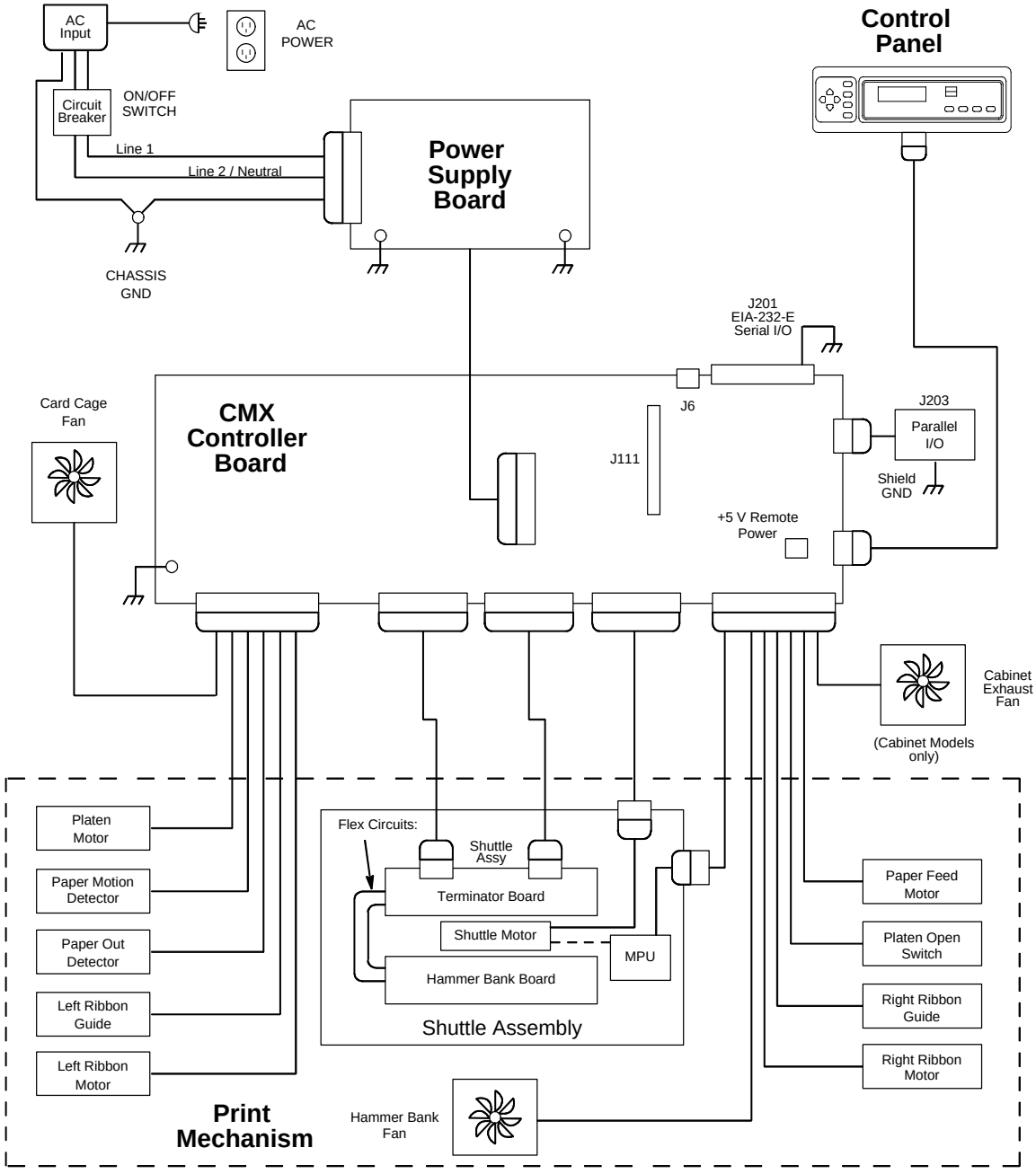


Figure 52. Functional Elements of the Printer

Control Panel

The user communicates with the printer by pressing keys on the control panel. The keys are momentary contact switches. The control panel processes and sends key closure information to the controller board and displays information from the controller on the LCD. A status indicator next to the LCD also conveys printer status information to the user.

The LCD, status indicator, and keys are mounted on a printed circuit board assembly enclosed in a protective housing.

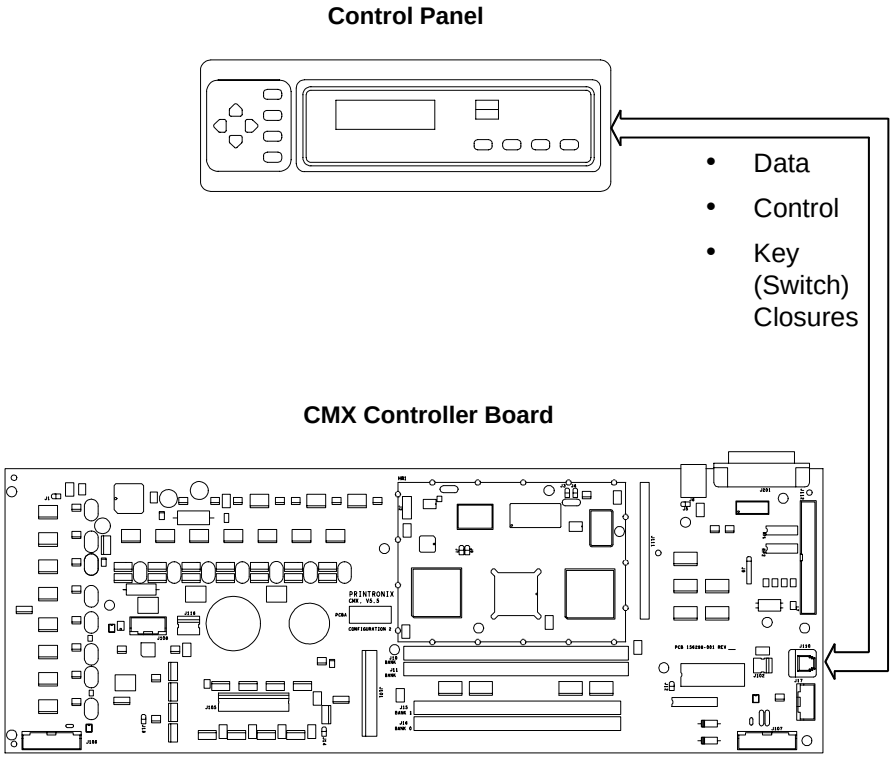


Figure 53. Control Panel Functional Overview

CMX Controller Board

The heart of the printer is the CMX controller board, which monitors and directs all printer functions. The controller board receives and processes all data from the host computer, builds the printable images, controls all motors, and drives the hammer springs. Except for the power supply and final hammer drive circuits, all logic and drive circuitry for the printer are contained on the controller board.

The CMX controller board consists of two functional units: the DC (Data Controller) and the EC (Engine Controller).

The DC is responsible for:

- Host I/O (Input/Output)
- Operator I/O
- Security Interface
- Print Image Generation
- Overall High Level (Logical) Control

The EC is responsible for:

- Print Mechanism Operation
- Print Mechanism Fault Monitoring
- Power Shutdown/Power Saving Modes

The EC and DC communicate through semaphore registers. The DC receives host and operator input and returns dot images and LCD messages to buffers in memory. Image data are passed to the EC upon request, are processed, then sent to the hammer bank. The EC synchronizes paper, ribbon, platen, and shuttle motion as it feeds dot data to the hammer drivers. Figure 54 summarizes this architecture.

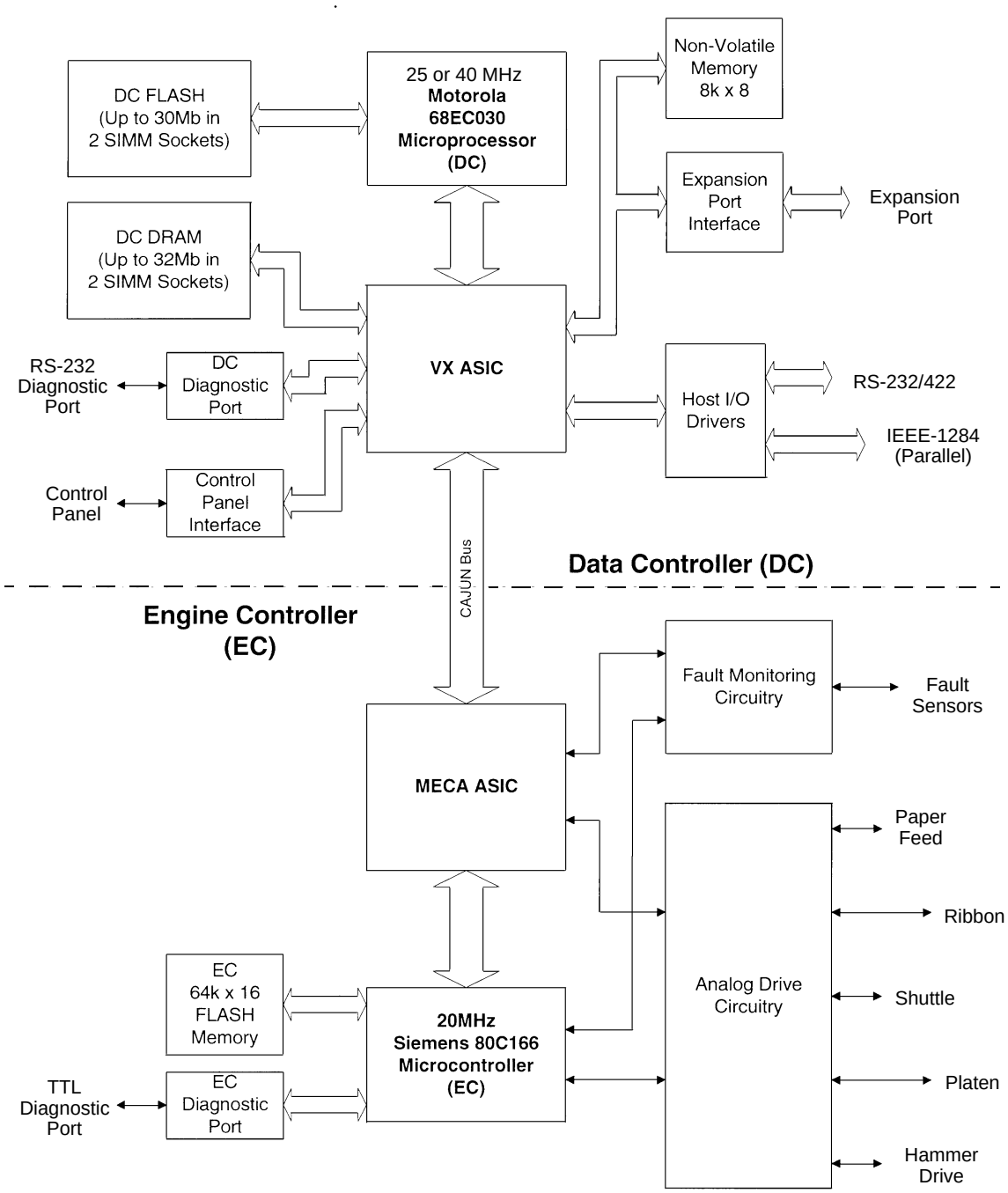


Figure 54. CMX Controller Board Block Diagram

Data Controller

The data controller (DC) consists of the following elements:

- 68EC030 microprocessor
- Two flash SIMM sockets, for up to 30MB of program memory
- Two DRAM SIMM sockets, for up to 32MB of data memory
- 8K x 8 Non-Volatile Battery-Backed static RAM (NVRAM) for storage of configuration and system statistical data
- VX ASIC (Application-Specific Integrated Circuit)
- Host I/O Drivers/Termination

68EC030 Microprocessor

A Motorola 68EC030 microprocessor serves as the processor of the DC unit. This processor runs at 25 MHz on all models except the P5X05B, P5X10, P5214, P5X15, and P5XKA.

On P5X05B, P5X10, P5214, P5X15, P5XKA printers the 68EC030 processor runs at 40 MHz and the controller board on these models is called the “CMX 040.” The CMX 040 controller is backwards compatible with any P5000 series printer, but must be used in P5X05B, P5X10, P5214, P5X15, and P5XKA printers.

Although this chapter refers to the DC microprocessor as simply the “030,” remember that two different clock speeds are available.

Flash Memory

The DC stores program and emulation code in flash memory. Flash memory is erasable, non-volatile, and significantly faster than a disk drive.

The DC uses AMD 5.0V-only flash memory, which does not require higher programming and erasing voltages on the board (it has an internal charge pump to make these voltages itself). This memory supports at least 100,000 write/erase cycles. The flash memory is 32 bits wide. It is byte, word, and double word readable, but is always written as double words.

Two 80-pin SIMM sockets are provided for flash memory. Up to 30MB of flash (total), organized as up to four banks, may be installed in the two sockets on the controller board. The boot code for the 68EC030 processor must reside in bank 0.

Programs stored in flash memory are changed through the parallel or serial port.

DRAM

System DRAM is used for program variables, image buffers, and input buffers. All DRAM supports page mode operation and is addressable by individual byte.

Two standard 72-pin DRAM SIMMs are used for expansion memory. The DC, through the VX ASIC, may address up to 32MB of DRAM in four banks.

NVRAM

An 8K x 8 bit Non-Volatile battery-backed static RAM (NVRAM) device provides for the storage of configuration and system statistical data.

VX ASIC

The VX is a multi-function custom gate array ASIC containing all the logic for the DC that is not contained in the 68EC030 processor. The VX provides the following services:

- Memory Access Controller
- DRAM Controller
- Flash Controller
- Two DMA Channels
- Operator Panel Interface
- “Dot Plucking” and Adjacent Dot Checking
- “Cajun” Bus Interface
- Host I/O and Diagnostic Port

Memory Access Controller

All 030 addresses go through the VX ASIC. The VX handles all address decoding, chip selects, DTACKs, and so on.

DRAM Controller

The VX supports up to four banks of page mode DRAM.

FLASH Controller

The VX supports up to four banks of flash memory.

DMA Channels

The VX provides two channels for direct memory access. These channels move data from the host interface or expansion bus to the DRAM and vice versa. One address is an I/O address, the other is a memory address with auto-increment.

Control Panel Interface

The VX operator panel interface consists of five lines: serial clock, serial data, and three select lines. It is the VX that handles all parallel-to-serial (and vice versa) conversion to and from the panel, as well as any special timing needed when toggling select lines, etc.

“Dot Plucking” and Adjacent Dot Checking

“Dot Plucking” is a specialized DMA function that removes dot data from a dot image buffer in DRAM in a programmable manner, serializes it, and sends it to the hammer bank. This function is actually controlled by the EC (see page 254), which has access to the VX through the “Cajun” Bus Interface.

“Cajun” Bus Interface

The “Cajun” bus connects the DC, the EC, and the expansion port. The EC uses this bus to access DC resources, including the semaphore registers. (The semaphore registers are the primary communications path between the EC and DC.)

Ports

The VX ASIC controls the following I/O functions:

- Interface to IEEE® 1284 Level 2 host
- Interface to RS-232-E serial host
- Interface to RS-422-B serial host

All the circuitry required for these types of hosts is provided on the CMX board, except for the drivers themselves, ESD protection, and terminations.

Host I/O Drivers and Termination

Beyond the 030 processor and VX ASIC, additional support circuitry completes the serial and parallel interfaces. These circuits include:

- RS-232 drivers and receivers. These circuits use internal charge pumps to eliminate the need for ±12V power.
- RS-422 differential drivers and receivers
- Parallel port pull-up and pull-down terminating resistors in DIP configuration for easy removal and installation.

All interface ICs and terminations have the following characteristics:

- Provide ESD protection to 15KV for all inputs.
- Less than 0.05V common mode ripple, measured at the power and ground of the interface ICs.
- Less than 0.02V common mode ripple, measured between chassis ground and the ground pins of the interface ICs.
- Greater than 200V/µs slew rate for all outputs.

Engine Controller

The engine controller (EC) consists of four main elements:

- 80C166 Microcontroller
- 128KB 5.0V-only FLASH program memory, organized as 64K x 16 bits. This memory is not expandable.
- MECA (Mechanism Engine Control ASIC)
- Analog drive circuitry

80C166 Microprocessor

The Siemens SAB 80C166 is a high-integration microcontroller. It has many features that suit it extremely well to real-time control applications. This controller and the MECA ASIC provide the functionality of three separate processors used in earlier controller board architectures. In this manual, the 80C166 is referred to as either the EC or the 166.

Bus Configuration

The 166 bus is configured for 18-bit address, 16-bit data, non-multiplexed and segmented operation. The flash memory runs with zero wait states. An external PAL is used for address decoding.

Power Reduction

The 166 chip has two power reduction modes: idle and Energy Star. Idle mode is not used. In Energy Star mode, +48V and all motors are de-energized, but the 166 operates as normal.

EC Flash Memory

The EC stores all boot code, program code, and tables in its own local flash memory. This flash is organized as 64Kx16 bits and uses the same technology as the DC flash: it is +5.0V-only and is rated for a minimum of 100,000 write/erase cycles. EC memory is fixed; it is soldered to the controller board. Its contents can be updated through the DC (through the serial or parallel ports). At run time, the EC also stores tables in shared DRAM, which is accessed through the Cajun bus.

MECA ASIC

The 166 uses numerous counters, PWM generators, and FIFOs in the MECA to control many printer motor functions. The MECA is a custom gate array, specifically designed to drive this system.

Analog Drive Circuitry

The analog drive circuits convert +48 volts and +8.5 volts into the power used to drive the motors and hammers in the printer. Sensors are used to monitor the operation and status of critical components within the printer.

The printer has five electric motors: two ribbon drive, one paper feed, one platen open, and one shuttle motor. The shuttle motor is a brushless DC motor driven by current control. The MPU encoder is used as feedback for motor commutations, hammer fire timing, and motor stall detection. The paper feed motor is a DC stepping motor driven by current control. The paper feed motor may be driven in full, half, or microsteps, depending on print requirements. The ribbon system uses two DC stepping motors that alternate drive and drag roles when the ribbon reaches turnaround. The drive ribbon motor is microstepped in voltage mode, while the drag motor is loaded and monitored to maintain correct linear speed and tension. The platen motor is driven in current mode and can be full or half stepped. The overall current level may be reduced for standby modes.

The paper feed, ribbon drive, and shuttle motors are driven in control loops containing power MOSFETs, voltage and current sensors, the MECA ASIC, and the EC processor. The platen motor is driven by a stepping motor controller IC and the EC processor.

Control of the hammer drive is split between the controller board and the hammer bank. Common circuits are located on the controller board, while circuitry specific to the hammers is contained on the hammer bank. The EC uses the MECA ASIC on the controller board to set timing and upper drive profiles for hammer fire events. The controller also contains diagnostic circuitry for the hammer system. The hammer bank contains HBA ASICs that interpret fire commands and data from the MECA and VX ASICs. The HBAs control lower drive MOSFETs on the hammer bank. These determine which hammers will participate in a fire event generated by the controller's upper drive.

Power Supply Board

The printer power supply is contained on a printed circuit board mounted on the rear wall of the card cage. The power supply automatically senses and adjusts to any commercial electrical system that provides AC mains potential in 50 or 60 Hertz systems. This means the printer can operate anywhere in the world on local commercial power.

The power supply converts alternating current (AC) to direct current (DC) at three voltage levels and sends the DC voltages to the controller board. The controller board distributes all DC power to the logic and electromechanical circuits.

AC Power

The power supply operates on AC voltages ranging from 88 volts to 270 volts. It can tolerate variations in frequency of 47 to 63 Hz. The power supply is designed to withstand an AC input overvoltage of 300 VAC for one second with no degradation of DC output voltage or damage to printer circuits.

DC Power

The power supply board contains two DC power supply systems for the printer. The first is a +5 V bus for logic. The second consists of +48 V and +8.5 V buses for the hammer bank and all motors.

The +5 V supply has an isolated return line that connects to the +48 V return at the printer load. Both returns are tied together in a one-point ground. The +5 V power supply has its own inverter, separate from the +48 V and +8.5 V outputs.

There is an opto-isolated input on the power supply that will shut down and latch off the +48 V and +8.5 V supplies unless it is pulled up to +5V with a 1K Ω resistor. This resistor is mounted on the controller board and may be pulled down or disconnected by software or internal cable interlocks. The +5 V output will remain stable for reporting and latching the fault condition. The return for this signal is the +5 V return. In addition, this shutdown circuit discharges and latches the +48 V down to a level lower than +15 V in less than 200 milliseconds and requires recycling of the circuit breaker (On/Off switch) to reset the latch.

Loss of +48 V is seen by the EC and reported as a fault.

Printer Interface

The printer interface is the point where the data cable from the host computer plugs into the printer. The printer interface processes all signals and data to and from the host computer.

The printer supports a number of standard and optional interfaces to the host:

- Centronics parallel (standard)
- IEEE 1284 parallel (standard)
- EIA®-232-E serial (standard)
- EIA-422-B serial (standard)
- Dataproducts Long Lines parallel (optional)
- Coaxial/twinaxial Expansion-CT (optional)
- PrintNet 10Base2 or 10Base-T Ethernet adapter (optional)

Selection of the interface is controlled by configuration menus accessed at the control panel. It is possible to physically connect more than one interface, but only one interface at a time can be used electrically.

Graphics

The *VGL Advanced Graphics* programming language (a QMS graphics emulation) and the *PGL Advanced Graphics* programming language (a Printronix IGP emulation) are options that install in flash memory on the CMX controller board.

These programming languages simplify the job of creating forms, bar codes, logos, expanded characters, and other graphics. The languages enable the printer to print sideways, upside down, and to make forms combining graphics, alphanumeric data, and bar codes—all in a single pass. Documents explaining configuration, operation, and programming are included with each option.

A Wire Data

NOTE: Acronyms and signal mnemonics are defined in Appendix C.

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Main Wire Harness Test Tables page 263
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Power Cable, Power Stacker page 293
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Fan Assembly, Hammer Bank page 295
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Switch Assemblies
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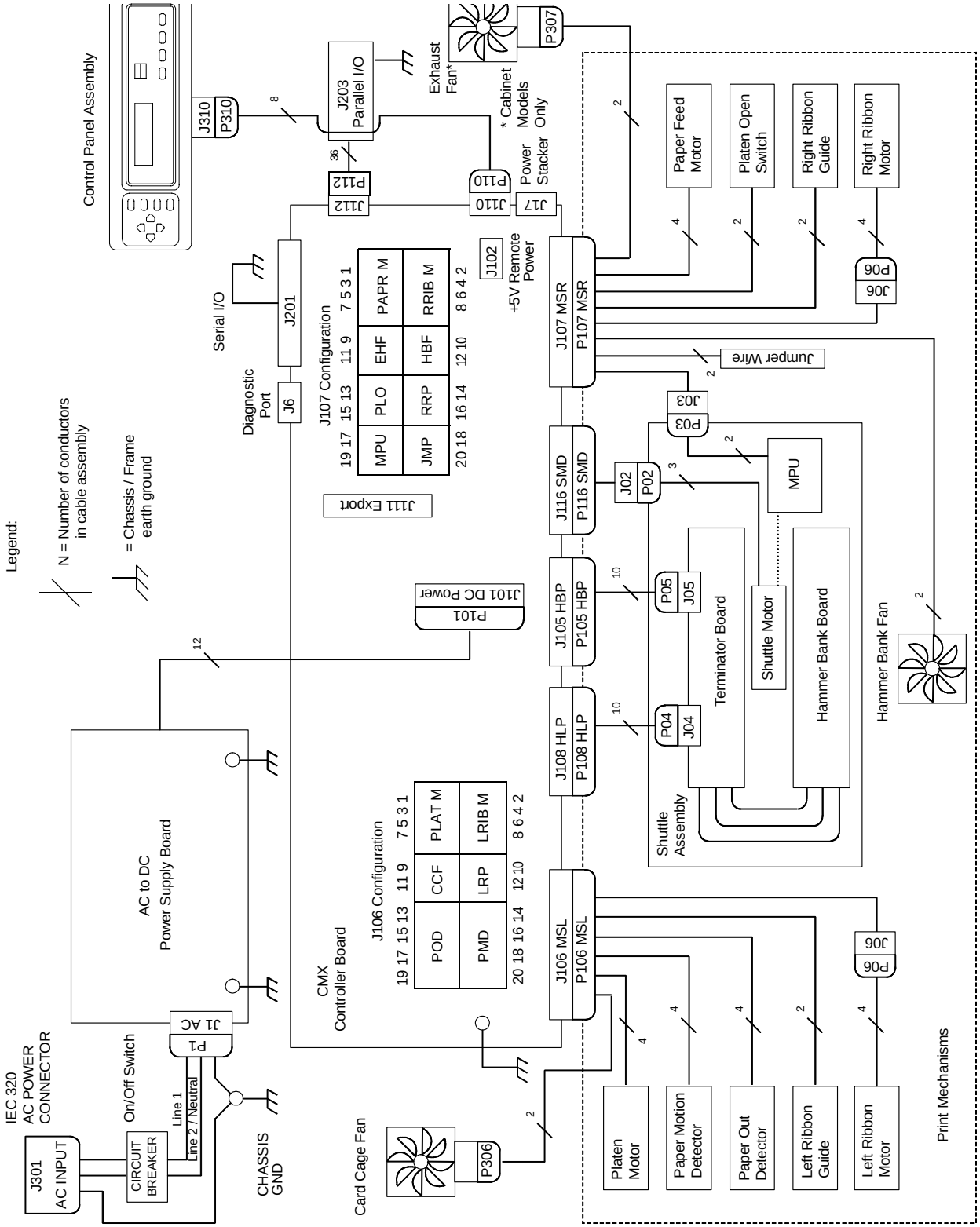
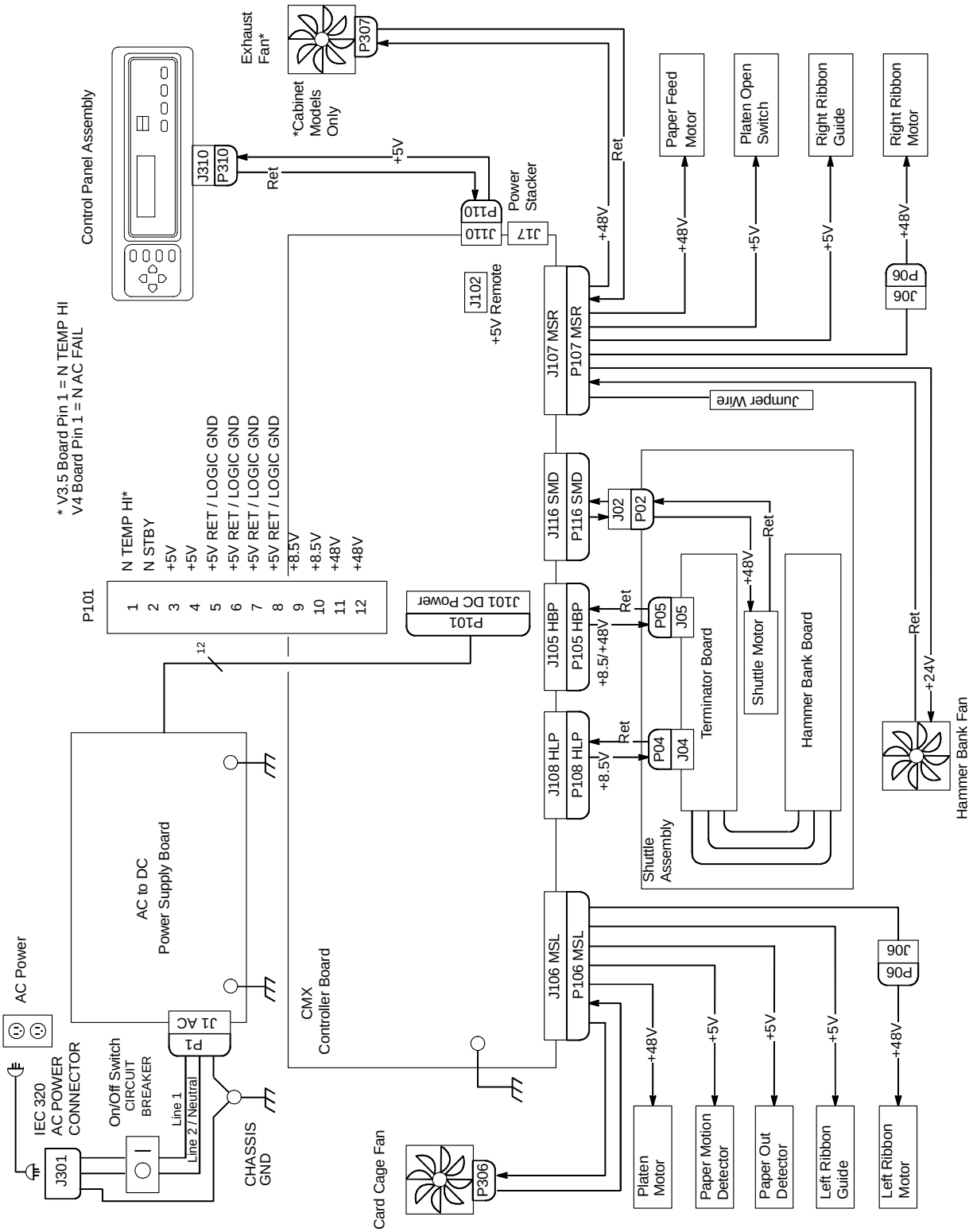
Switch Assembly, Platen Interlock page 298

Interconnection Diagram



Power Distribution Diagram



Main Wire Harness Test Tables

P106 Connector

1 3 5 7	9 11	13 15 17 19 ← Pin No.
PLAT M	CCF	POD
LRIB M	LRP	PMD
2 4 6 8	10 12	14 16 18 20

Resistance

Device	P106 Pins	Normal
LRIB M	2, 4 and 6,8	7.2 - 8.8 Ω
PLAT M	1, 3 and 5, 7	1.35 - 1.65 Ω
LRP	10, 12	Open across pins Short across post
CCF	9, 11	4.6 Ω
PMD	14, 16 18, 20	8 MegΩ Open
POD	13, 15 17, 19	8 MegΩ Open

CCF = Card Cage Fan
LRIB M = Left Ribbon Motor
LRP = Left Ribbon Guide
PLAT M = Platen Open Motor
PMD = Paper Motion Detector (Switch)
POD = Paper Out Detect (Switch)

P107 Connector

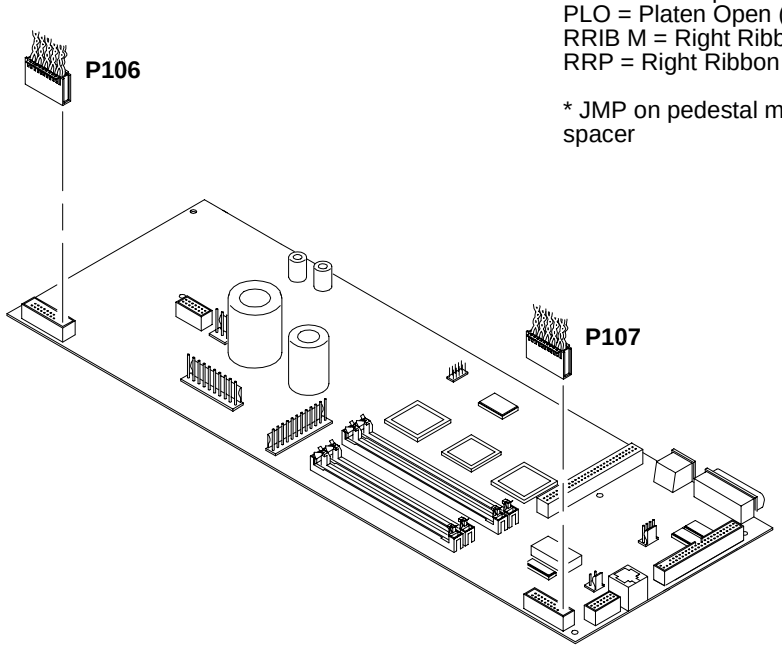
1 3 5 7	9 11	13 15 17 19	
PAPR M	EHF	PLO	MPU
RRIB M	HBF	RRP	JMP
2 4 6 8	10 12	14 16	18 20

Resistance

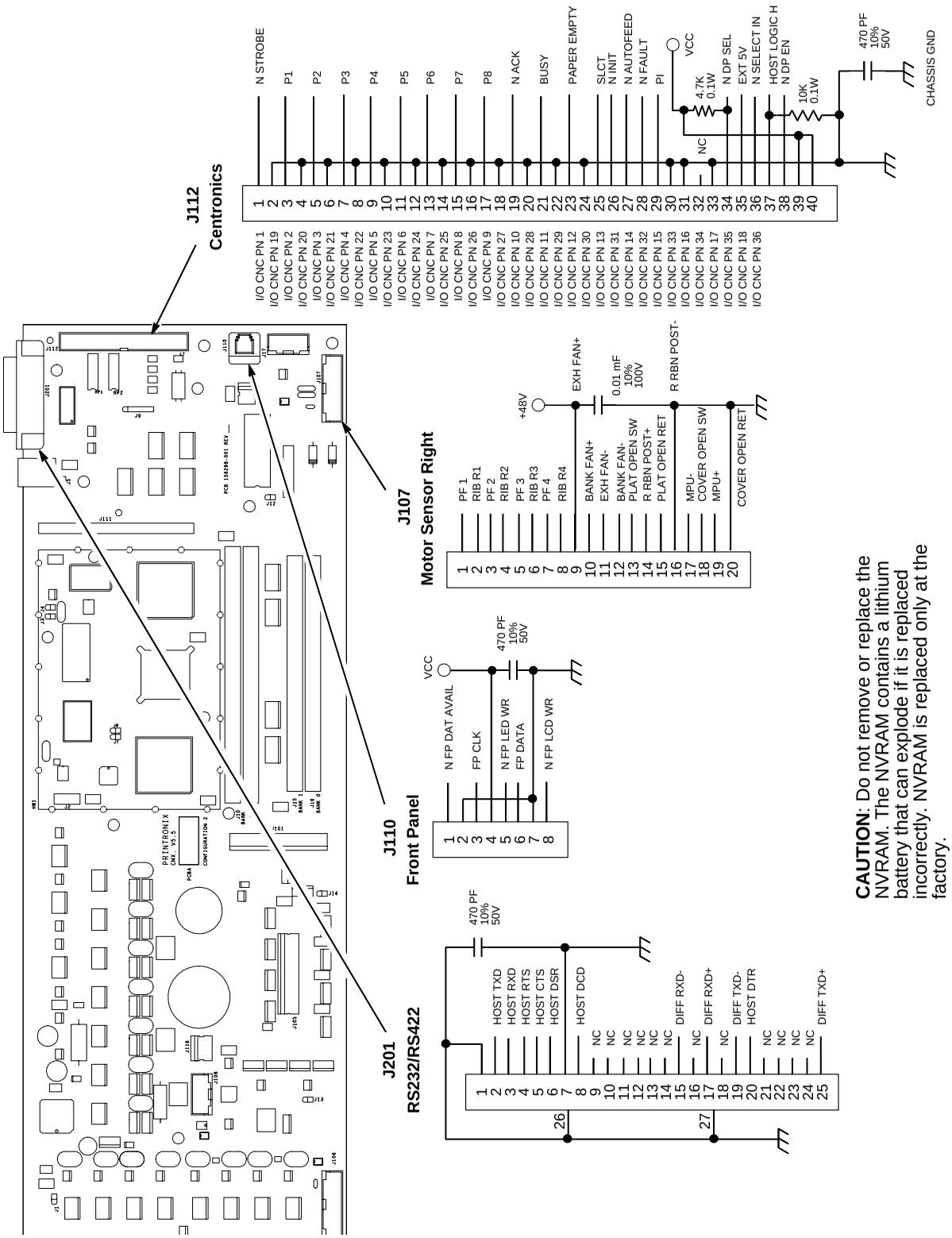
Device	P106 Pins	Normal
RRIB M	2, 4 and 6,8	7.2 - 8.8 Ω
PAPR M	1, 3 and 5, 7	0.417 - 0.681 Ω
HBF	10, 12	2.7 Ω
EHF	9, 11	4.6 Ω
RRP	14, 16	Open across pins Short across post
PLO	13, 15	Continuity: switch closed Open: switch open
JMP	18, 20	0.00 Ω
MPU	17, 19	670 Ω

EHF* = Exhaust Fan
HBF = Hammer Bank Fan
JMP = Jumper Wire
MPU = Magnetic Pickup
PAPR M = Paper Feed Motor
PLO = Platen Open (Switch)
RRIB M = Right Ribbon Motor
RRP = Right Ribbon Guide

* JMP on pedestal models: used as a spacer

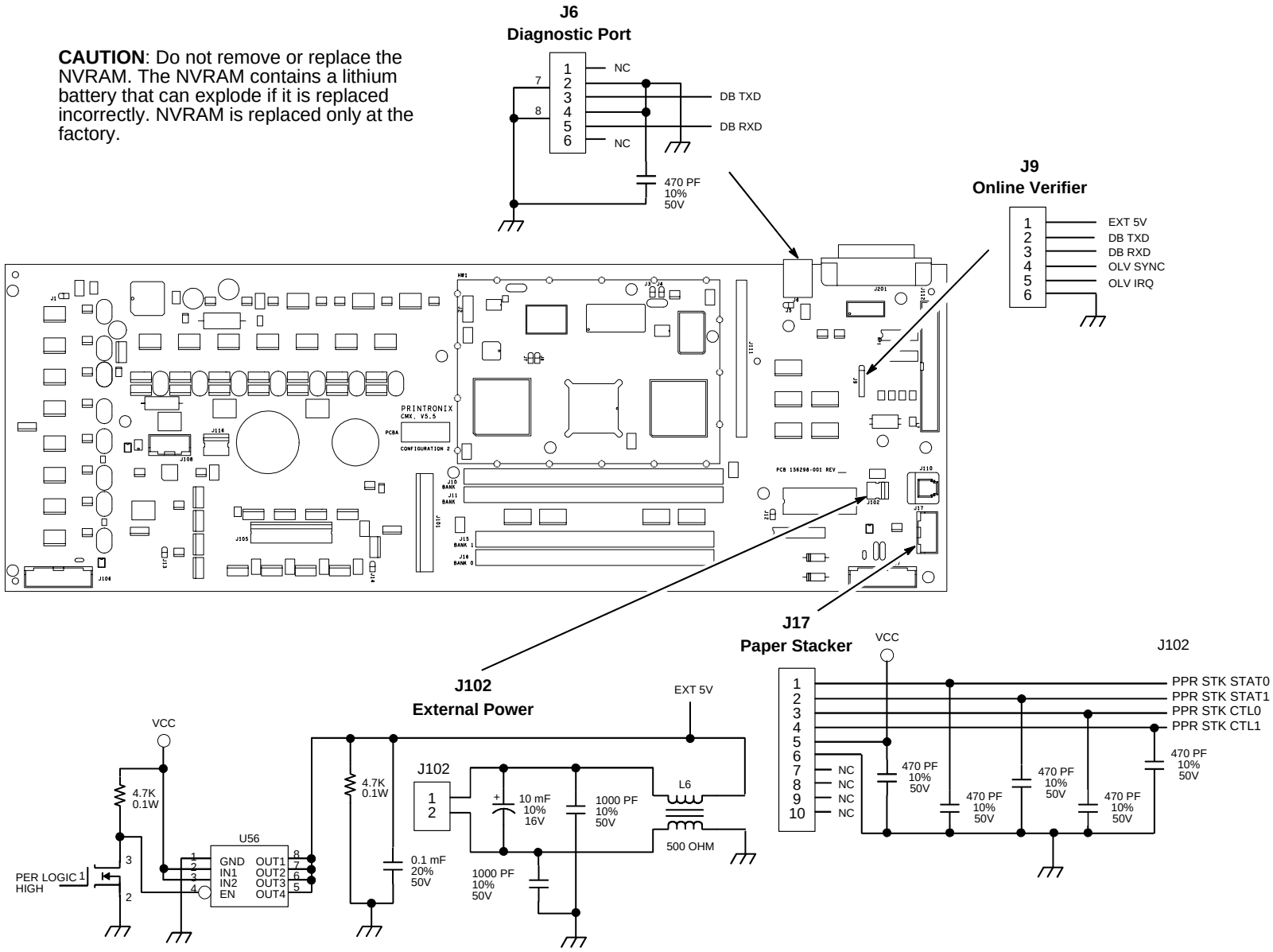


Controller, CMX

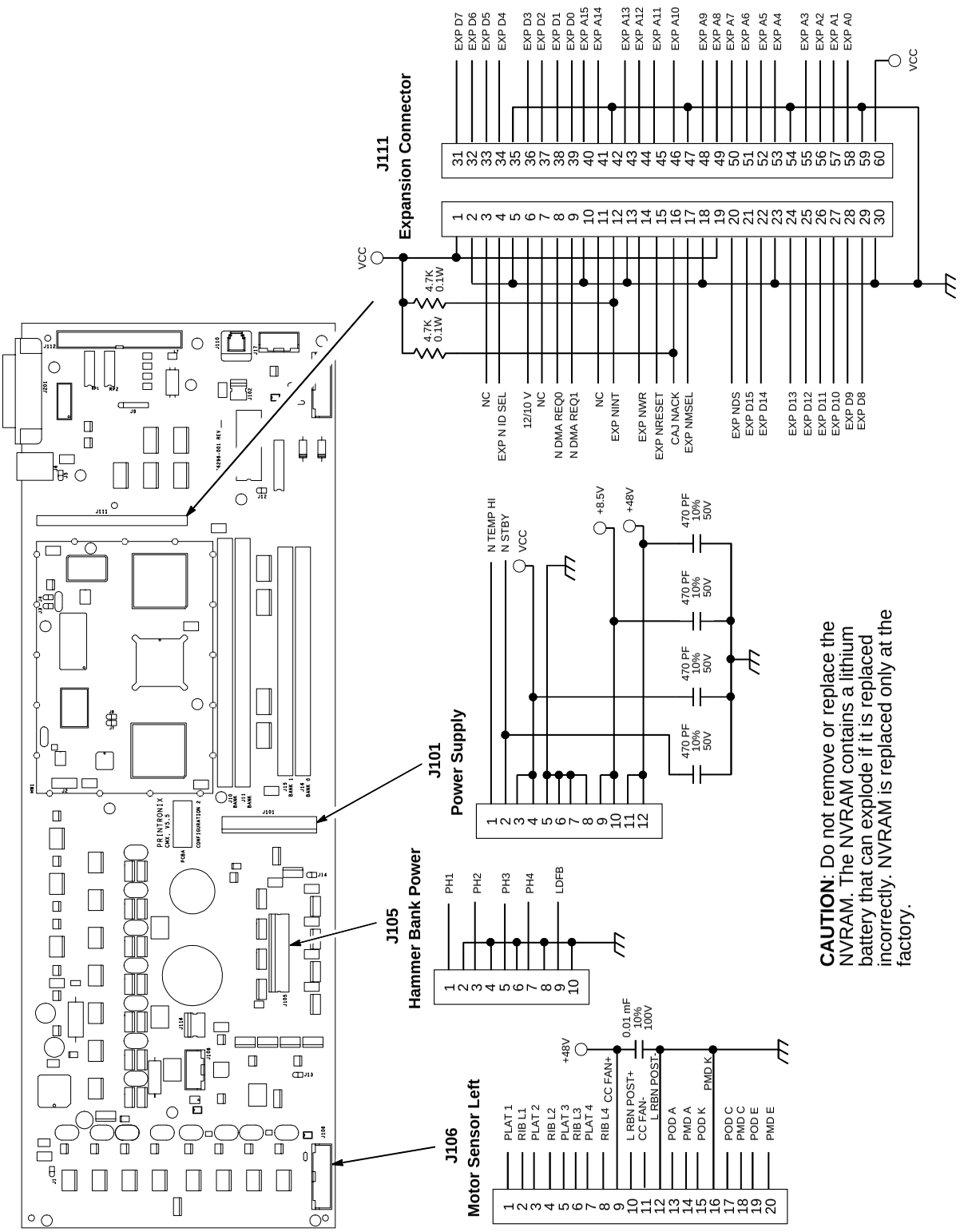


CAUTION: Do not remove or replace the NVRAM. The NVRAM contains a lithium battery that can explode if it is replaced incorrectly. NVRAM is replaced only at the factory.

CAUTION: Do not remove or replace the NVRAM. The NVRAM contains a lithium battery that can explode if it is replaced incorrectly. NVRAM is replaced only at the factory.

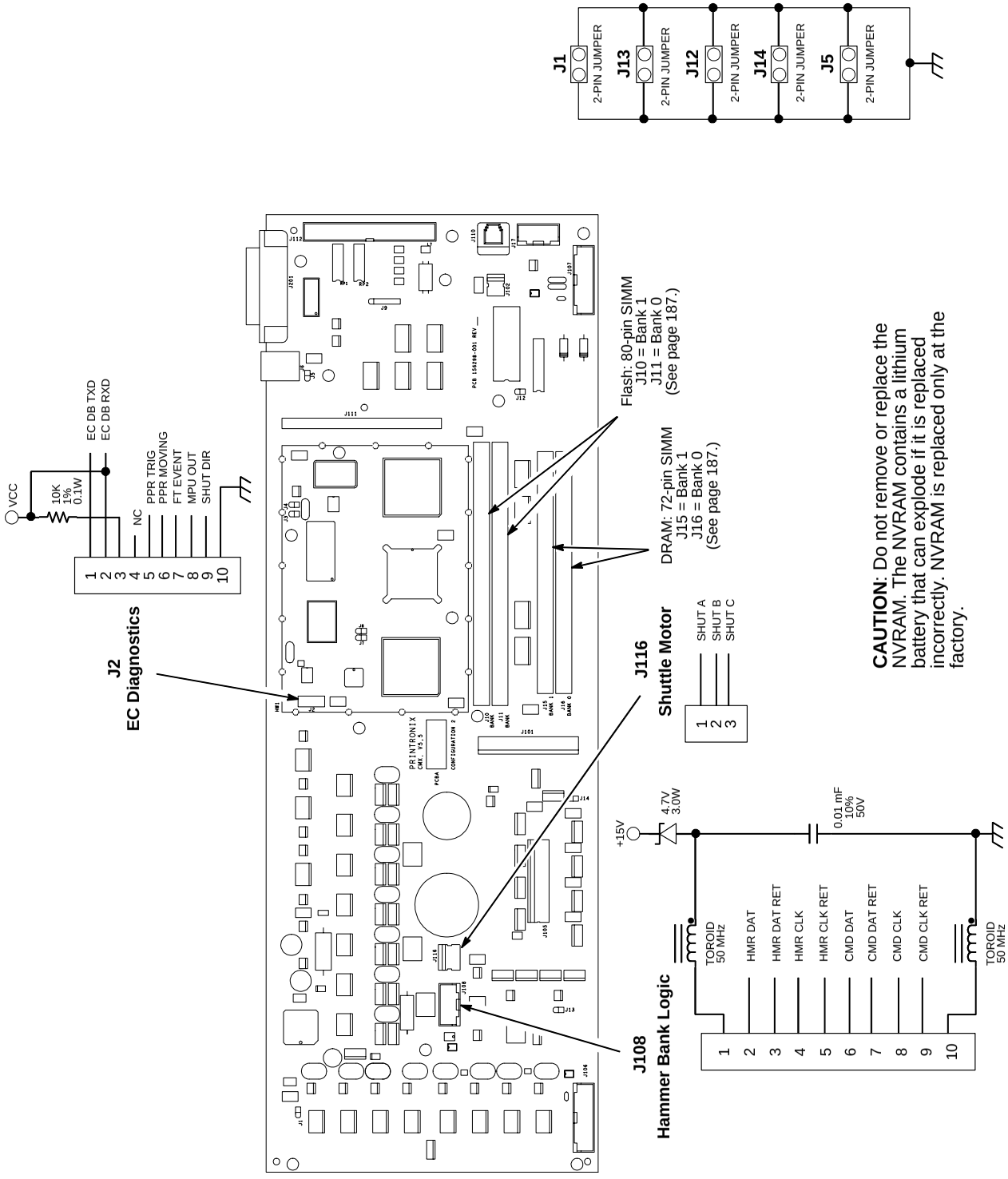


Controller (continued)

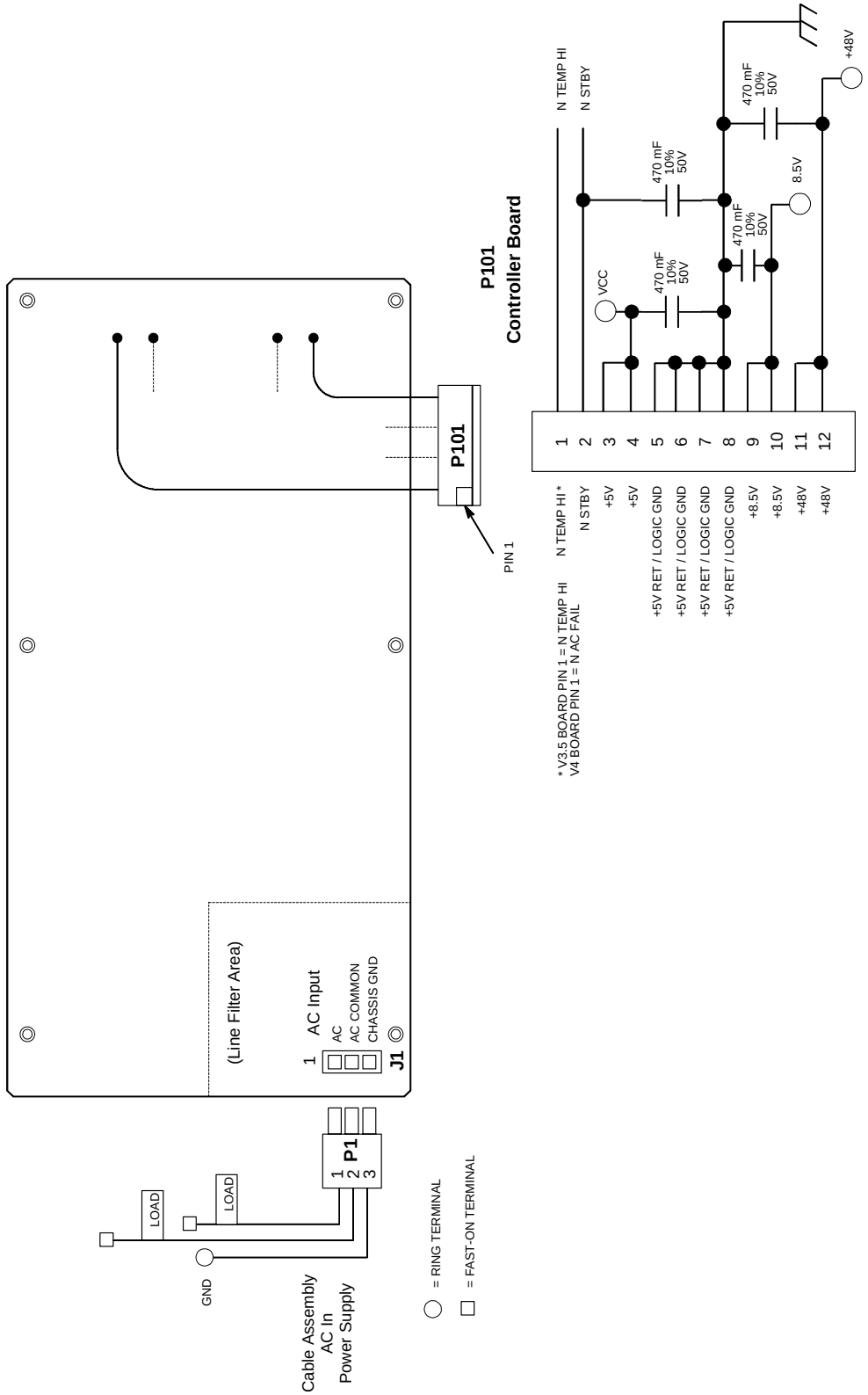


CAUTION: Do not remove or replace the NVRAM. The NVRAM contains a lithium battery that can explode if it is replaced incorrectly. NVRAM is replaced only at the factory.

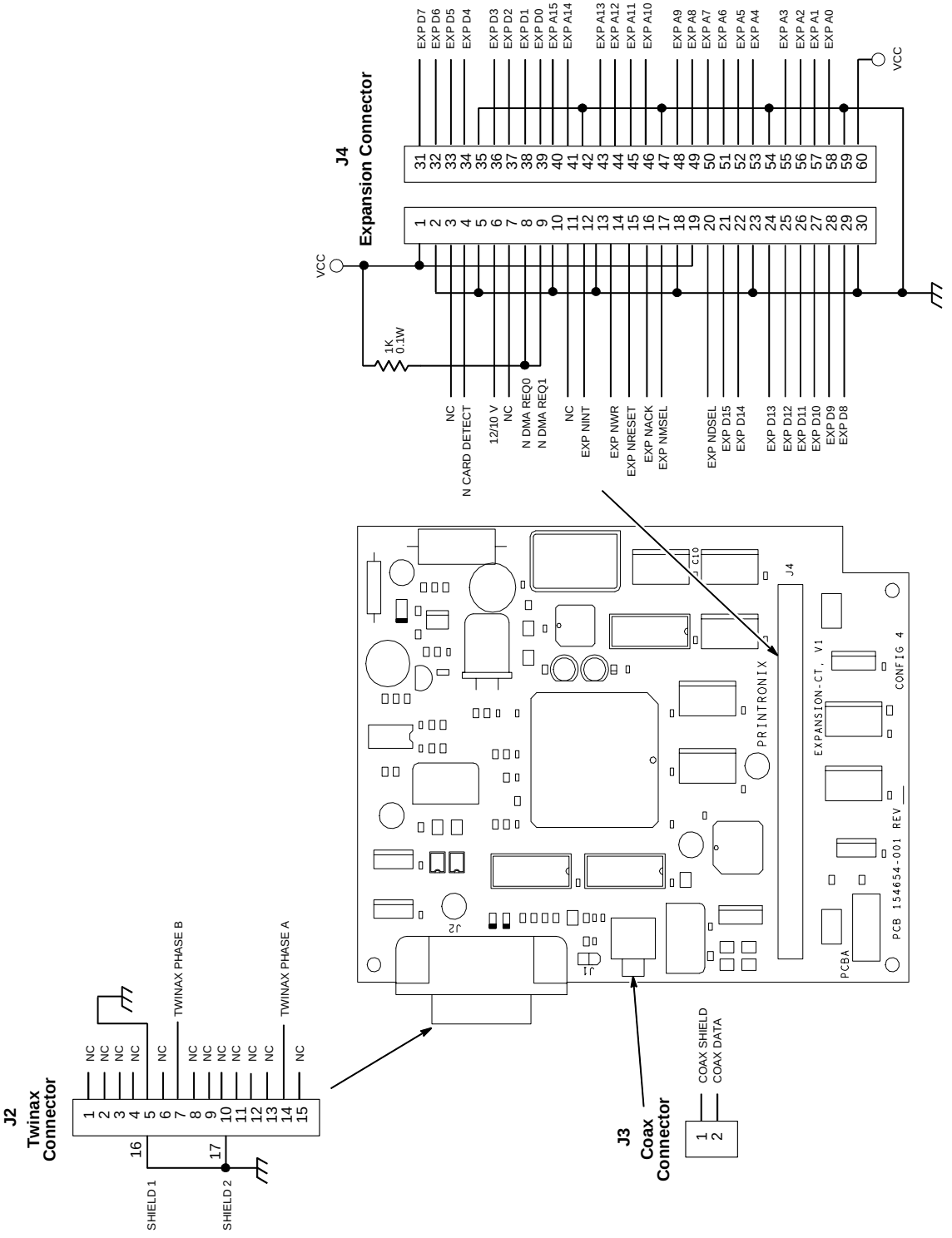
Controller (continued)



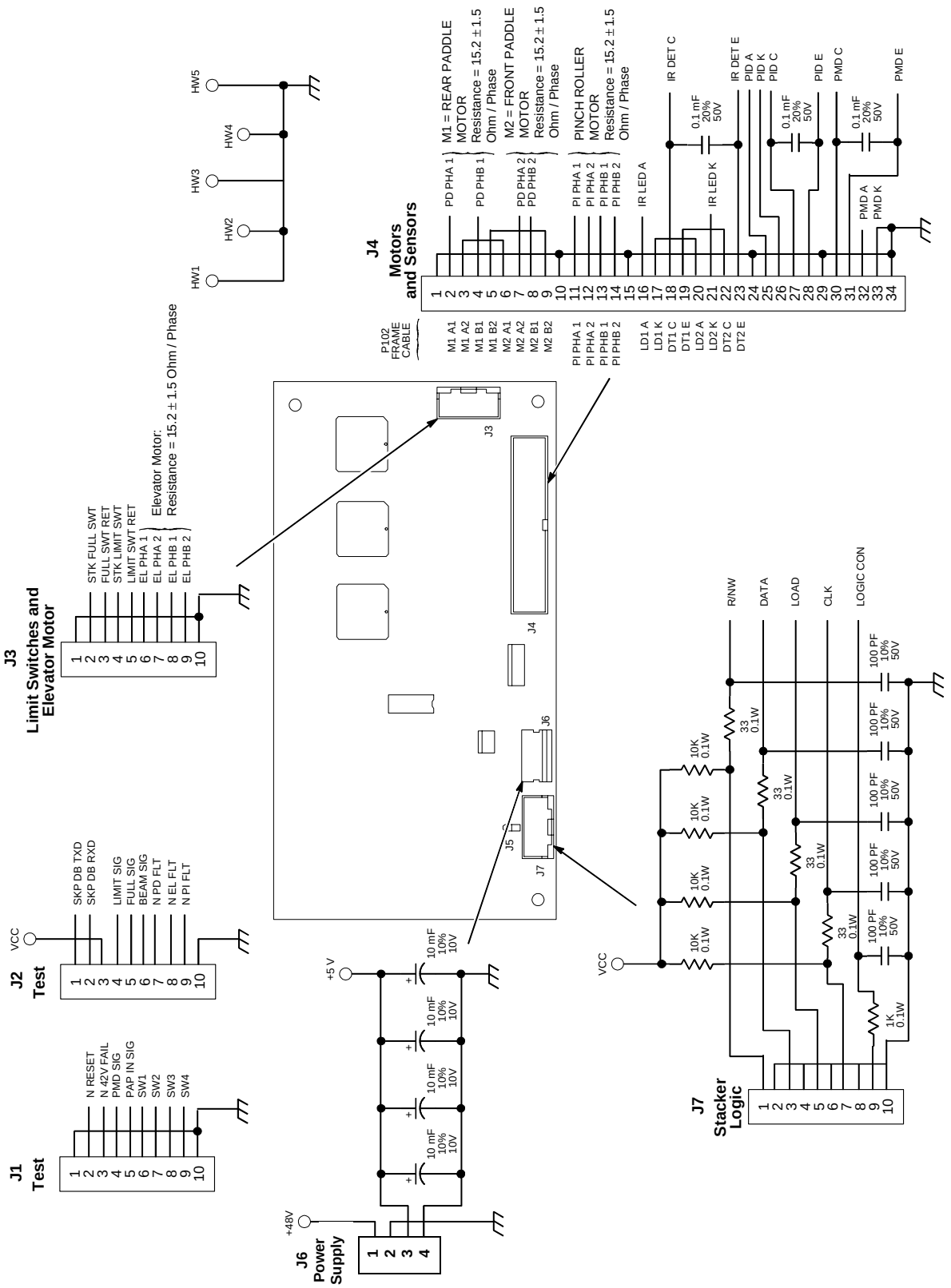
Power Supply



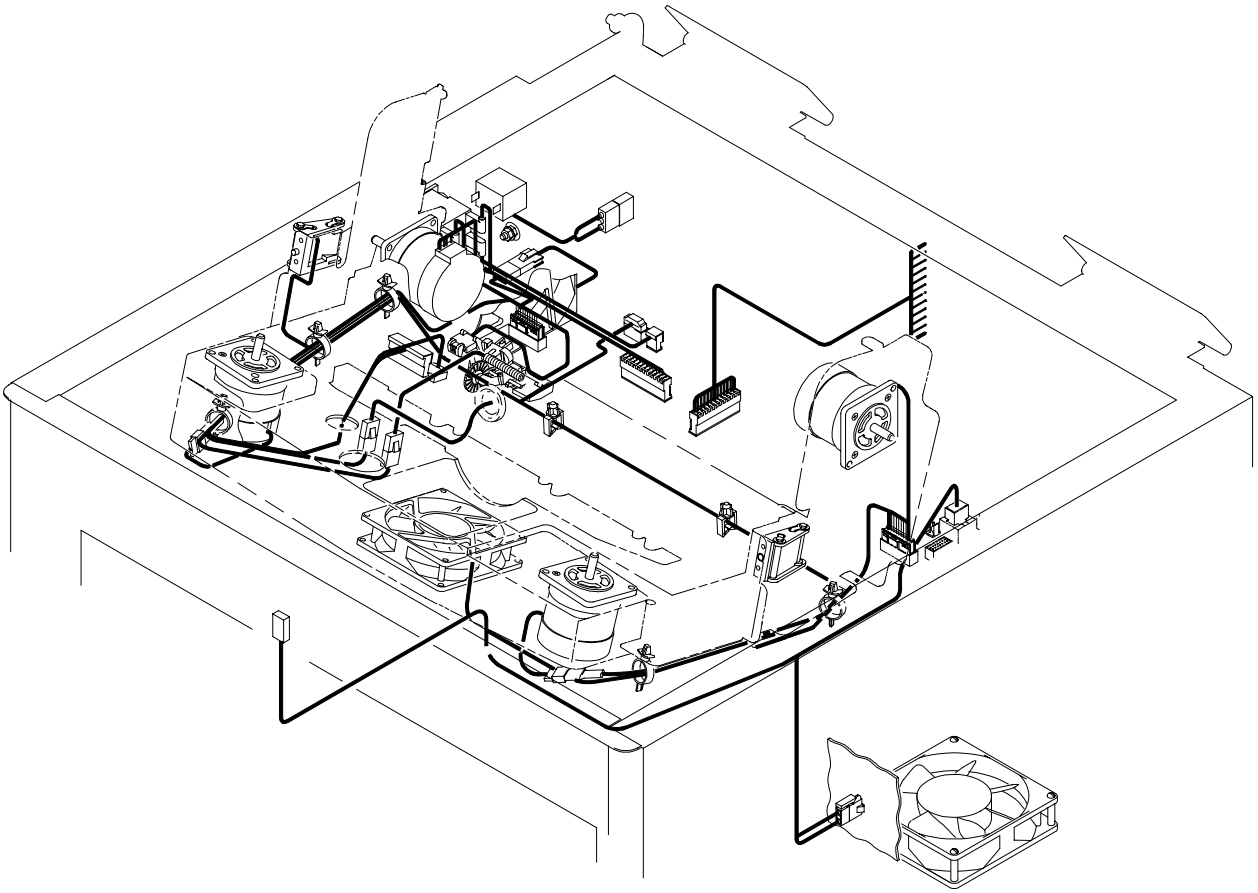
Expansion-CT



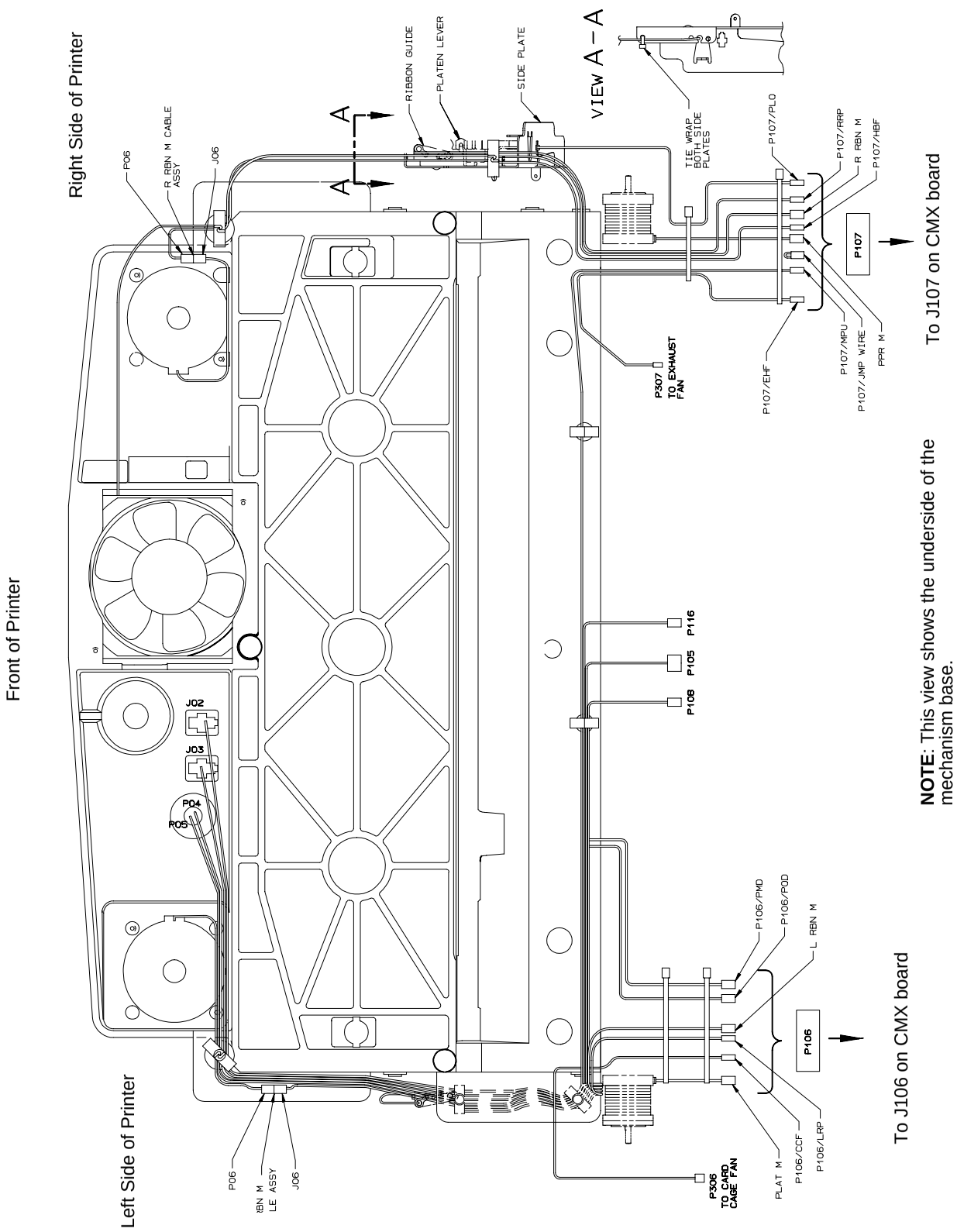
SureStak Power Stacker PCBA



Cable Routing, Cabinet Model

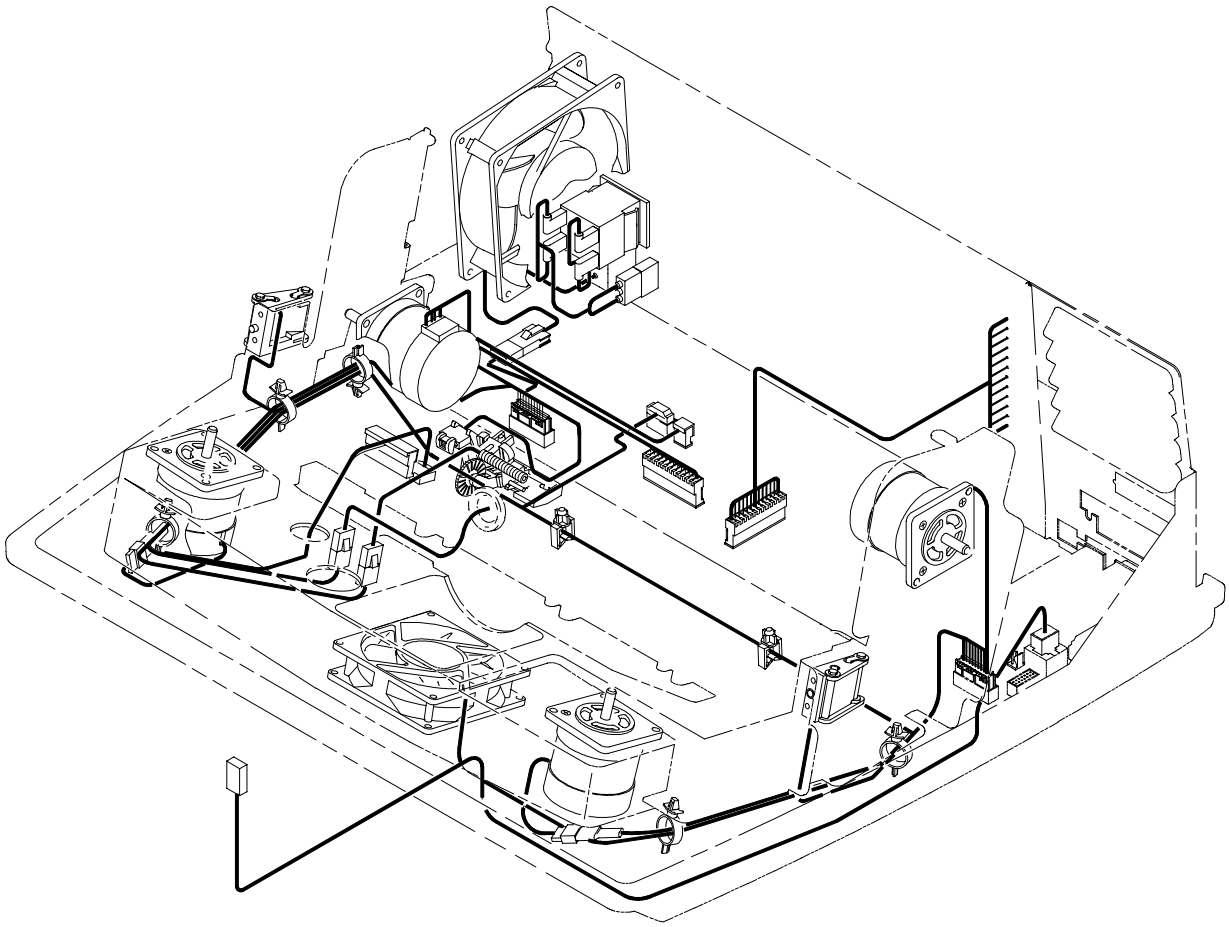


Cable Routing, Mechanism Base, Cabinet Model

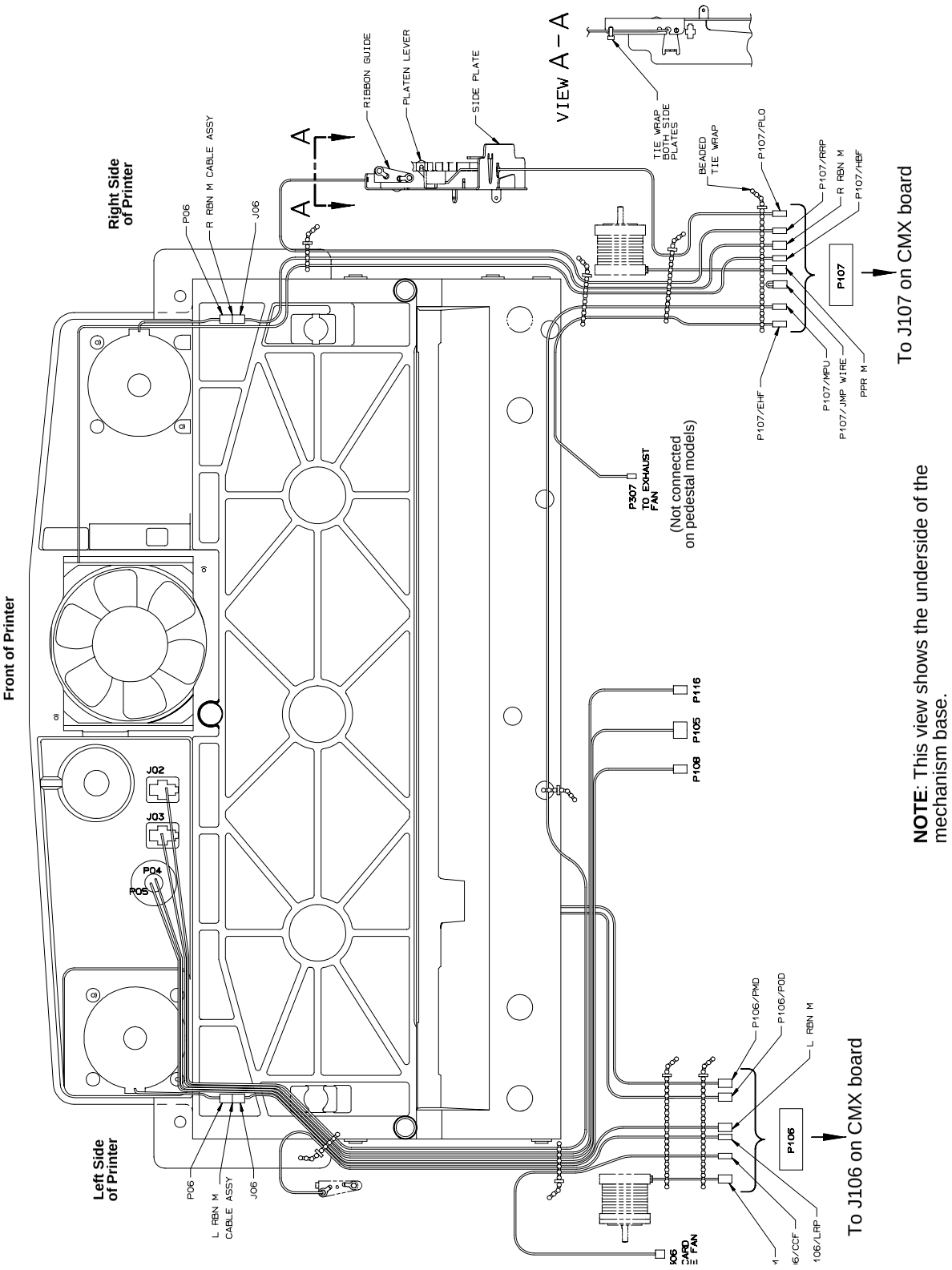


NOTE: This view shows the underside of the mechanism base.

Cable Routing, Pedestal Model

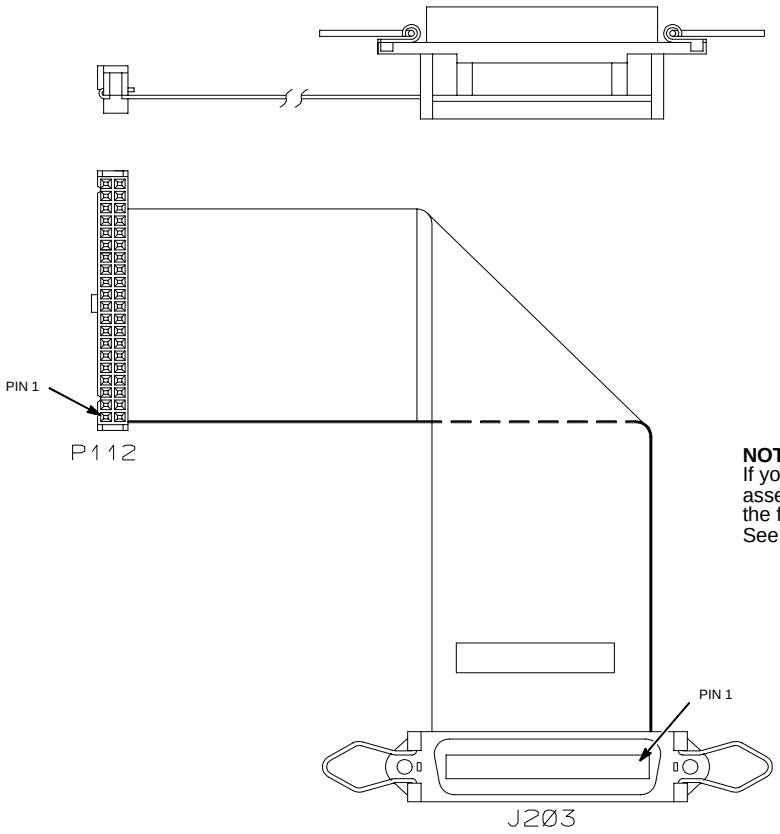


Cable Routing, Mechanism Base, Pedestal Model



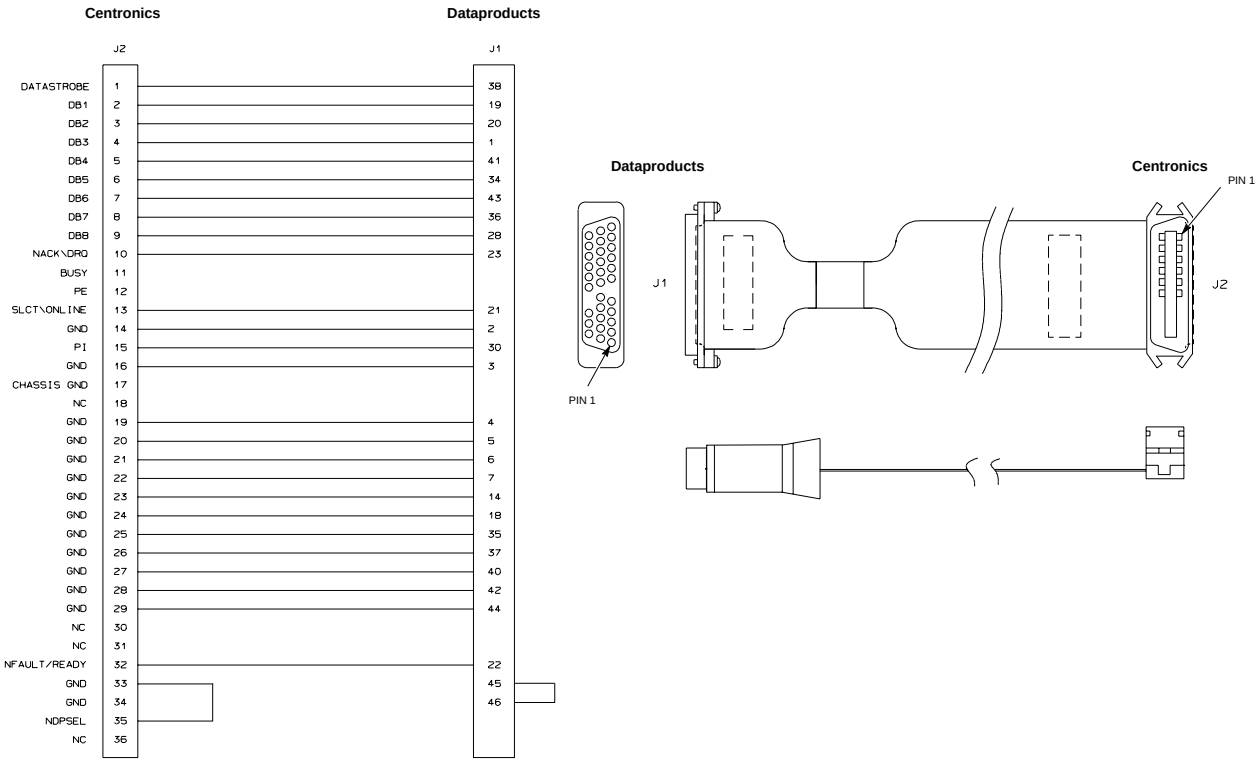
NOTE: This view shows the underside of the mechanism base.

Cable Assembly, Centronics I/O (P/N 152439-901)

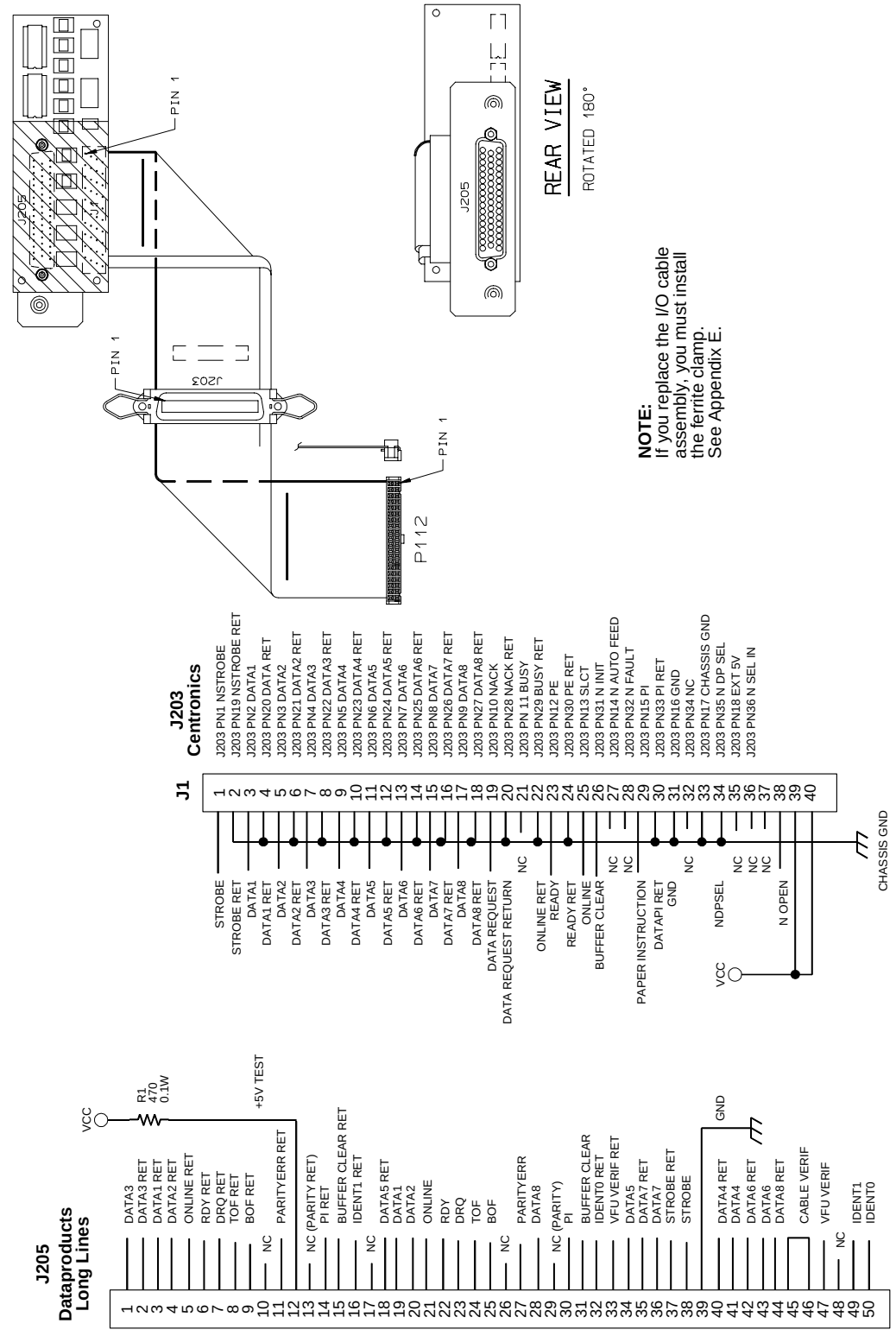


NOTE:
If you replace the I/O cable assembly, you must install the ferrite clamp.
See Appendix E.

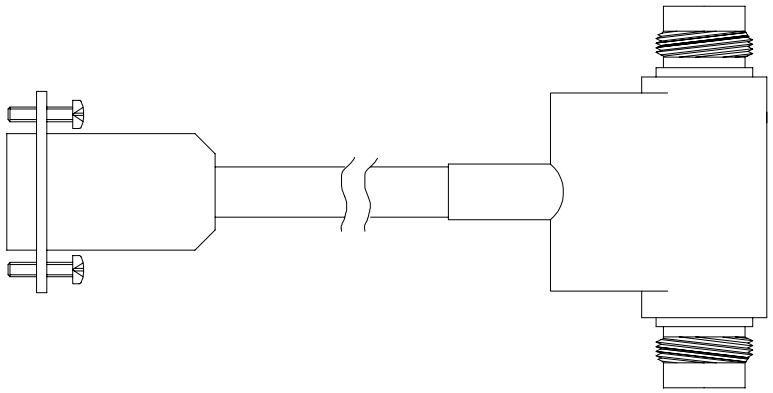
Cable Assembly, Dataproducts Adapter (P/N 703316-001)

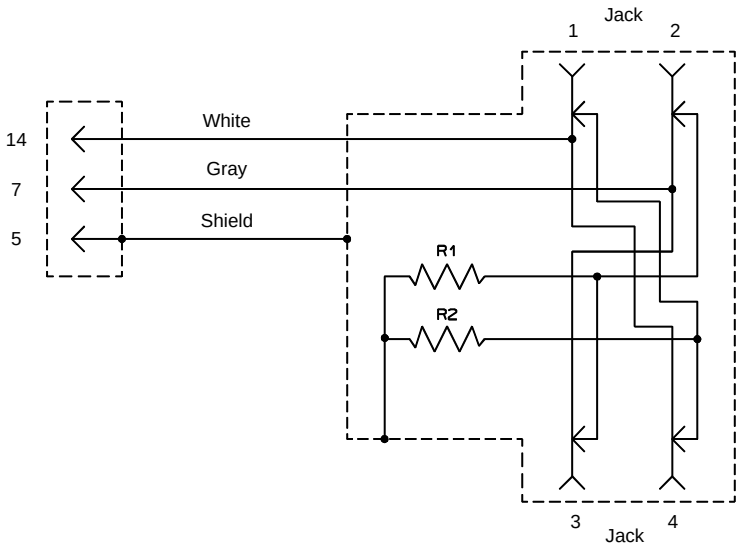


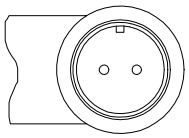
Cable Assembly, Dataproducts Long Lines I/ (P/N 154649-901)



Cable Assembly, Twinax Auto-Termination (P/N 140752-002)



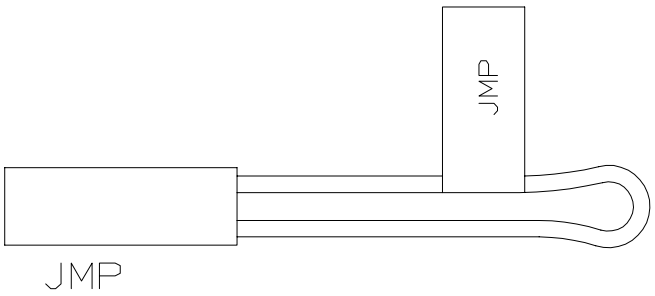




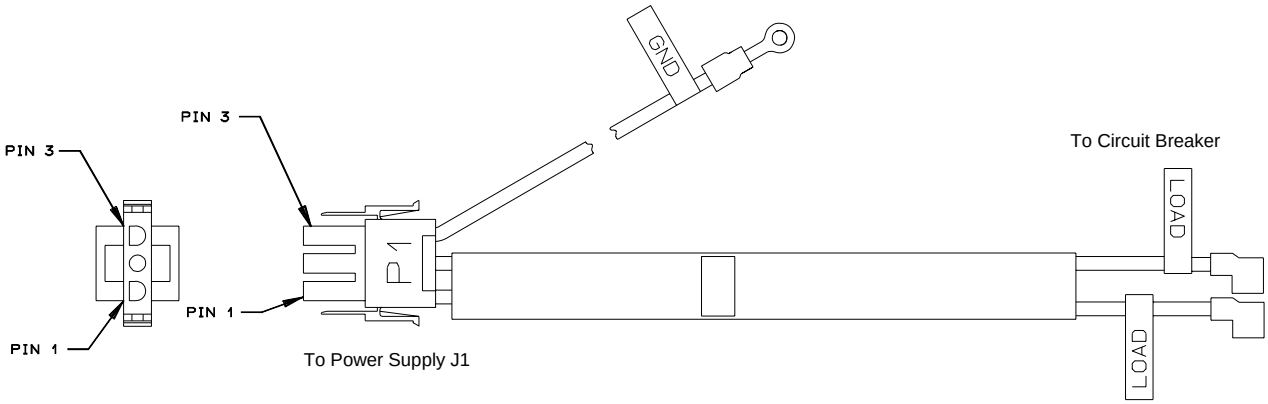
Resistance Chart

Pin	Pin	Ohms
1	2	110
3	4	110
1, 2, 3, 4	Shield	55
5	Shield	0
14	1, 4	0
7	2, 3	0

Cable Assembly, 2-Pin Jumper, 0.1 Ctr (P/N 154470-901)

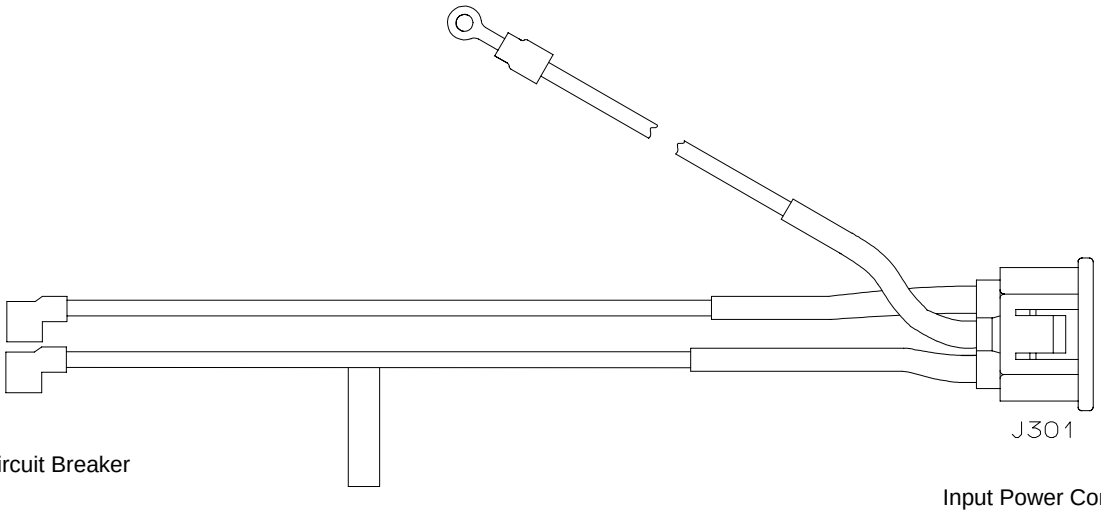


Cable Assembly, AC In, Power Supply
(AC Kit P/N 153502-901)



PIN	WIRE COLOR
1	BLACK
2	WHITE
3	GREEN/YELLOW

Cable Assembly, AC Power Input (AC Kit P/N 153502-901)

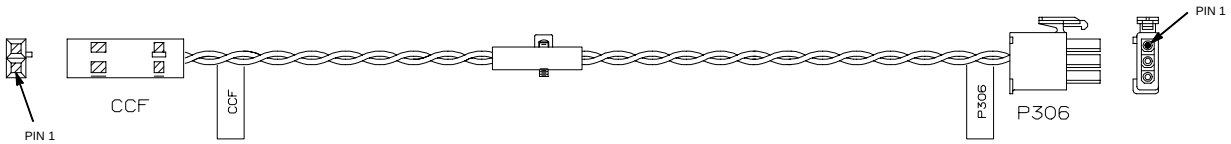


To Circuit Breaker

Input Power Connector

PIN	WIRE COLOR
LINE	BLACK
NEUTRAL	WHITE
GROUND	GREEN/YELLOW

Cable Assembly, Card Cage Fan (P/N 152422-901)

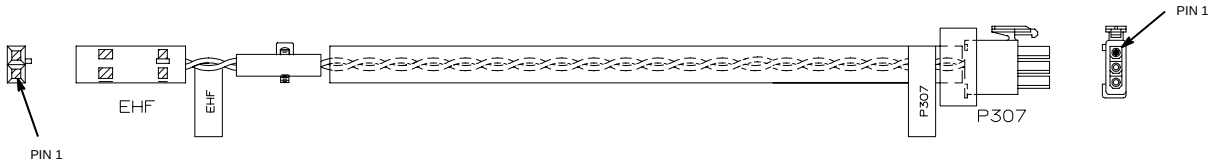


WIRE TABLE		
CCF	P306	WIRE COLOR
PIN 1	PIN 3	BLACK
PIN 2	PIN 2	GRAY
	PIN 1	N/C

Cable Assembly, Control Panel (P/N 152440-901)

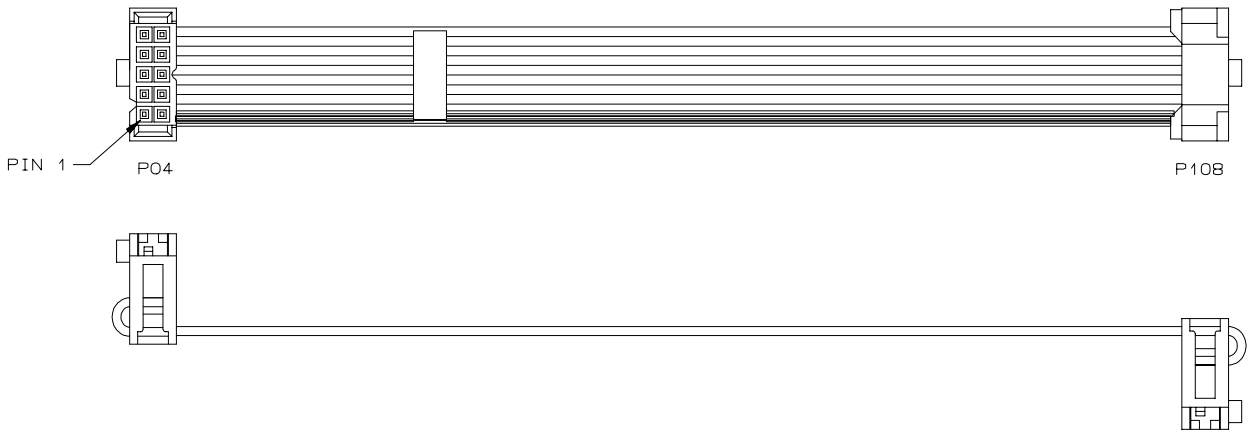
NOTE: If you replace the control panel cable, you must install two ferrite shielding beads. See Appendix E.

Cable Assembly, Exhaust Fan (P/N 152424-901)

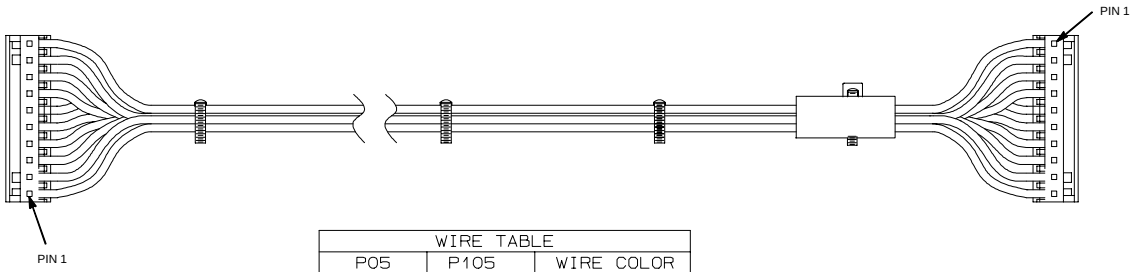


WIRE TABLE		
EHF	P307	WIRE COLOR
PIN 1	PIN 3	BLACK
PIN 2	PIN 2	GRAY
	PIN 1	N/C

Cable Assembly, Hammer Bank Logic (P/N 152421-901)

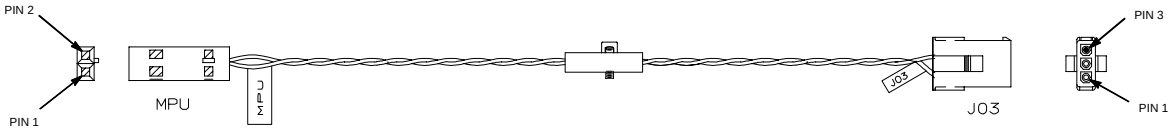


Cable Assembly, Hammer Bank Power (P/N 152423-901)



WIRE TABLE		
P05	P105	WIRE COLOR
2	1	GRAY
1	2	BLACK
4	3	GRAY
3	4	BLACK
6	5	GRAY
5	6	BLACK
8	7	GRAY
7	8	BLACK
10	9	GRAY
9	10	BLACK

Cable Assembly, MPU (P/N 152425-901)

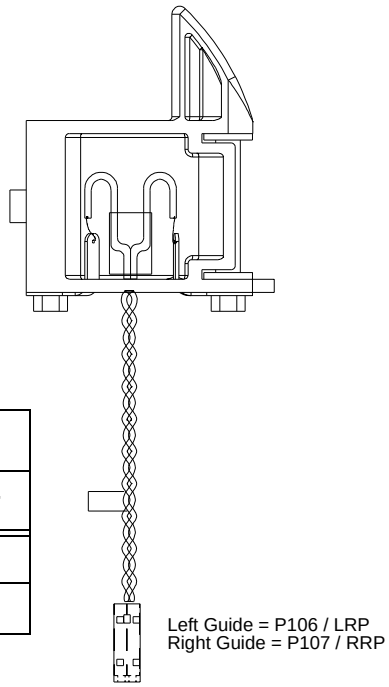


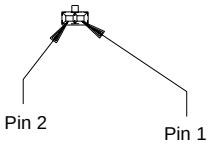
WIRE TABLE		
MPU	J03	WIRE COLOR
1	1	BLACK
2	2	GRAY
	3	N/C

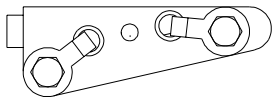
Cable Assembly, Ribbon Guide Kit (P/N 163597-901)

NOTE: Left ribbon guide shown. Right is mirror image.

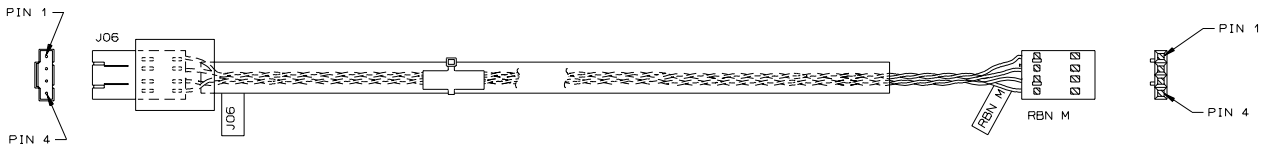
Pin Connection	
P106 (LRP) / P107 (RRP)	**Wire Color**
Pin 1	Black
Pin 2	Black





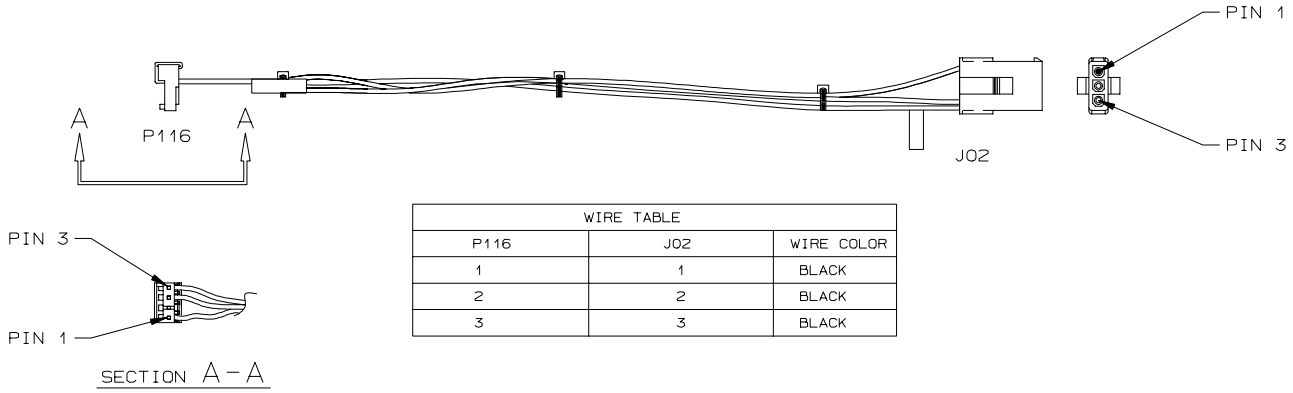


Cable Assembly, Ribbon Motor, Extension (P/N 154067-901)



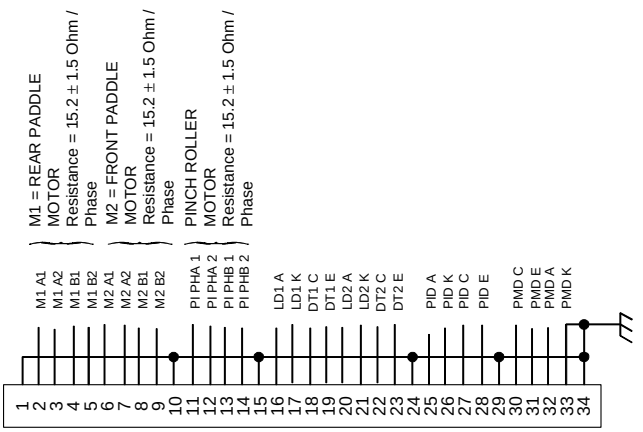
PIN CONNECTION		
J06	RBN M	WIRE COLOR
PIN 1	PIN 1	BROWN
PIN 2	PIN 2	ORANGE
PIN 3	PIN 3	RED
PIN 4	PIN 4	YELLOW

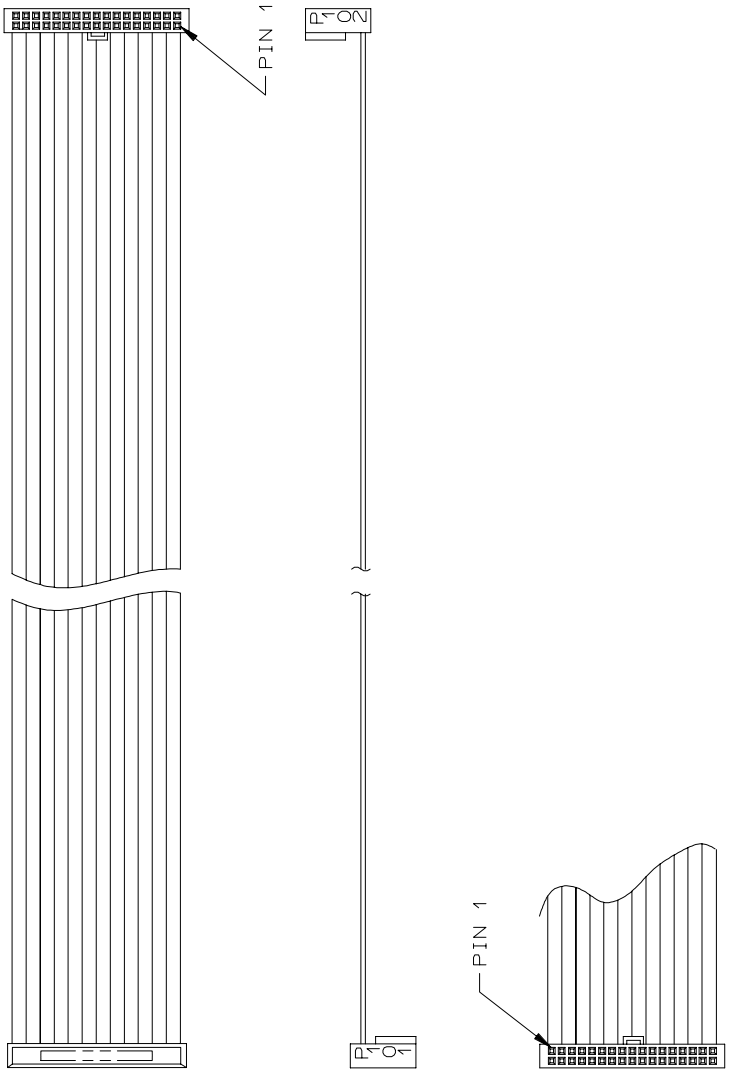
Cable Assembly, Shuttle Motor Drive (P/N 152420-001)



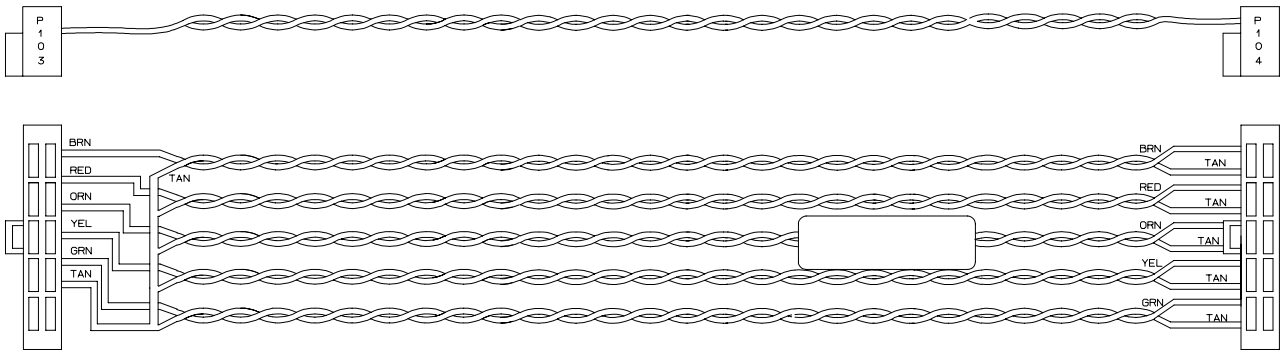
WIRE TABLE		
P116	J02	WIRE COLOR
1	1	BLACK
2	2	BLACK
3	3	BLACK

Frame Cable, Power Stacker (P/N 158445-001)





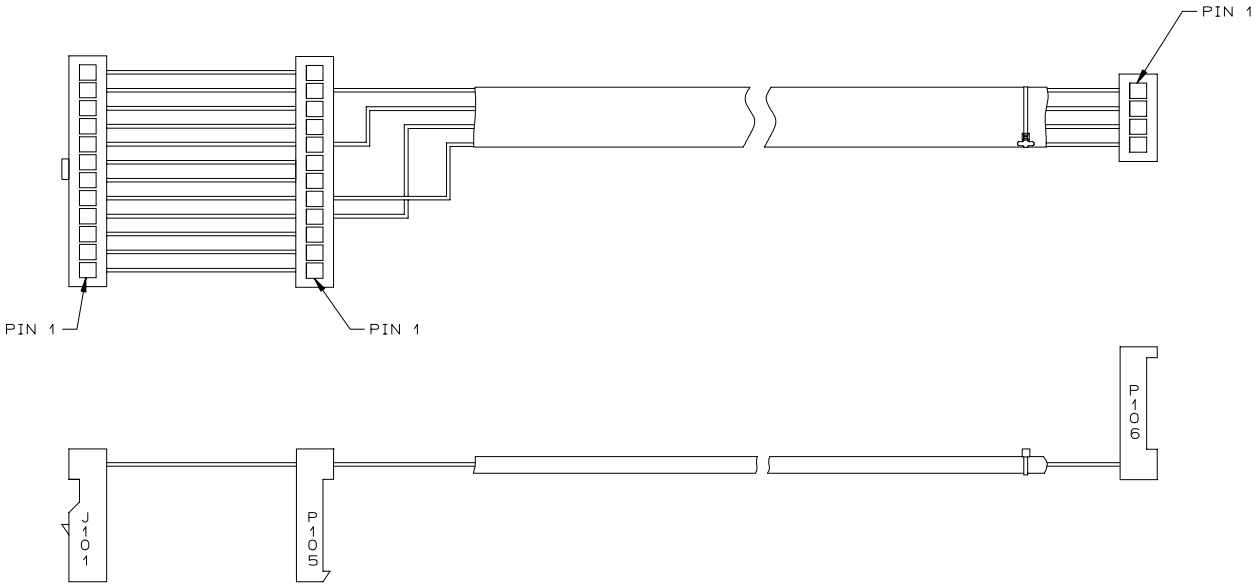
Logic Cable, Power Stacker (P/N 158444-001)



TWISTED PAIR COLOR CODING		
PAIR	LINE	COLOR
1	1	BRN
	2	TAN
2	3	RED
	4	TAN
3	5	ORN
	6	TAN
4	7	YEL
	8	TAN
5	9	GRN
	10	TAN

CONNECTION TABLE			
P103	LINE	P104	LINE
PIN 1	1/BRN	PIN 1	1/BRN
PIN 2	3/RED	PIN 2	2/TAN
PIN 3	5/ORN	PIN 3	3/RED
PIN 4	7/YEL	PIN 4	4/TAN
PIN 5	9/GRN	PIN 5	5/ORN
PIN 6	2,4,6,8,10	PIN 6	6/TAN
PIN 7	N/C	PIN 7	7/YEL
PIN 8	N/C	PIN 8	8/TAN
PIN 9	N/C	PIN 9	9/GRN
PIN 10	N/C	PIN 10	10/TAN

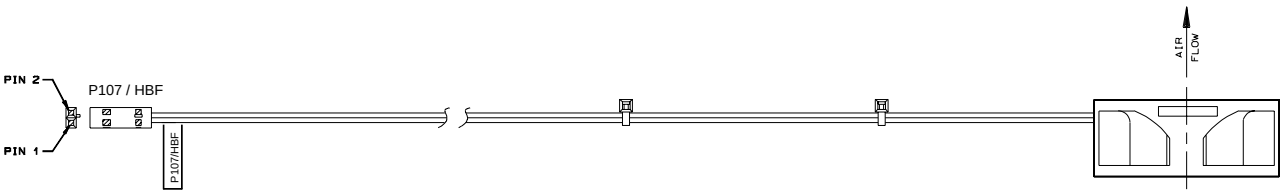
Power Cable, Power Stacker (P/N 158443-001)



CONNECTION TABLE			
J101	P105	P105	P106
PIN 1	PIN 1	PIN 11	PIN 1
PIN 2	PIN 2	PIN 8	PIN 2
⋮	⋮	PIN 4	PIN 3
PIN 11	PIN 11	PIN 5	PIN 4
PIN 12	PIN 12		

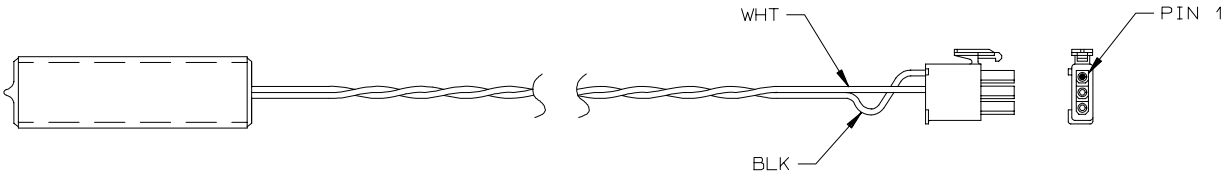
Vertical Rail Cable, Power Stacker (P/N 158442-001)

Fan Assembly, Hammer Bank (P/N 152416-901)



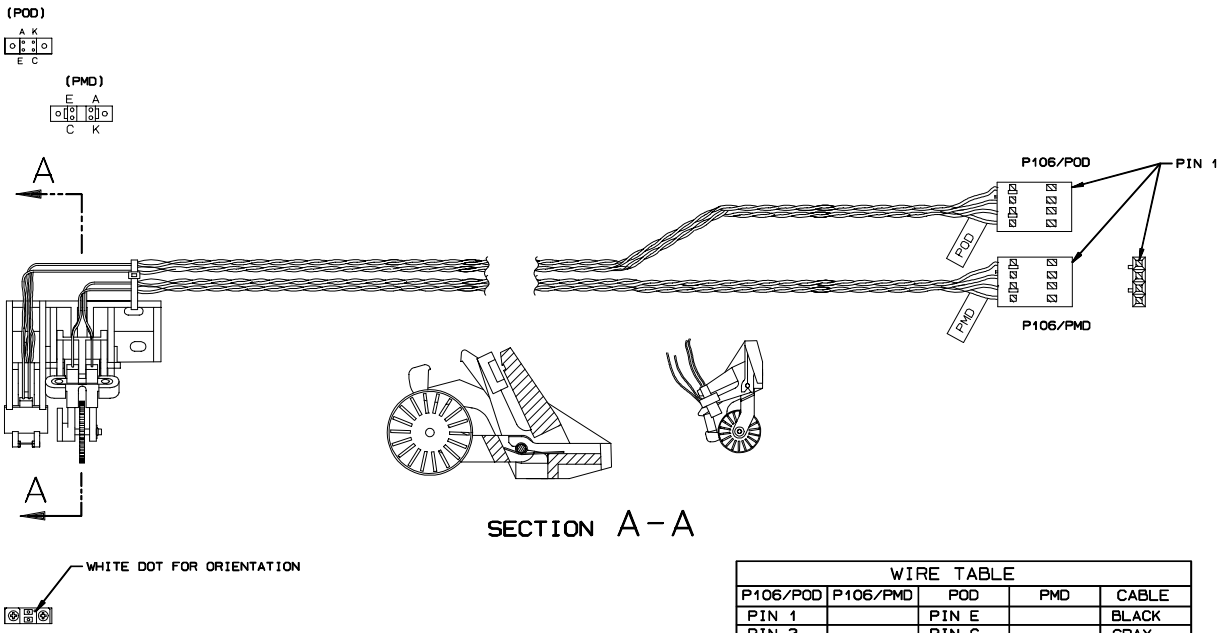
WIRE TABLE		
P107	POLARITY	HBF(J)
PIN 2	-	BLACK
PIN 1	+	RED

Magnetic Pickup (MPU) Assembly (P/N 150281-901)



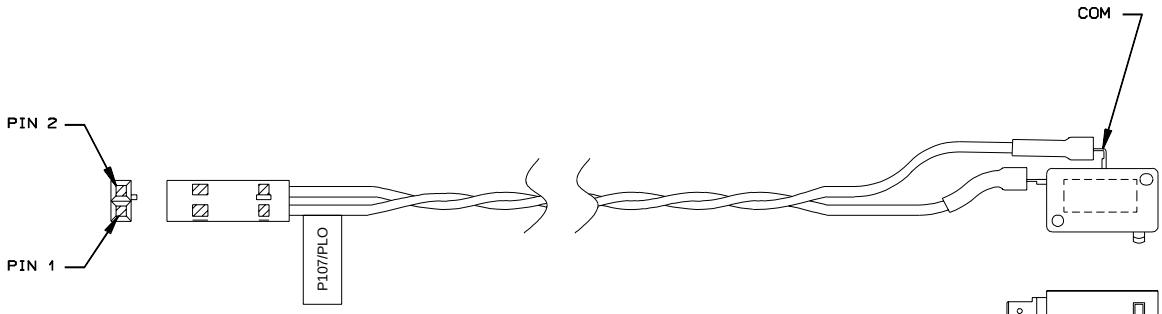
WIRE TABLE	
CONN PIN NO.	WIRE COLOR
1	BLACK
2	WHITE
3	N/C

Switch Assembly, Paper Detector (P/N 152415-901)



WIRE TABLE				
P106/POD	P106/PMD	POD	PMD	CABLE
PIN 1		PIN E		BLACK
PIN 2		PIN C		GRAY
PIN 3		PIN K		WHITE
PIN 4		PIN A		RED
	PIN 1		PIN A	BLACK
	PIN 2		PIN K	BROWN
	PIN 3		PIN C	ORANGE
	PIN 4		PIN E	RED

Switch Assembly, Platen Interlock (P/N 152417-901)



WIRE TABLE		WIRE COLOR
PIN NO.	INTERLOCK SWITCH	
PIN 1	COM	BLACK
PIN 2	NO	GRAY

B *Abbreviations & Signal Mnemonics*

NOTE: Mnemonics with first letter “N” are negative true.

Abbreviation or Mnemonic	Definition
KΩ	1,000 Ohms
MegΩ	1,000,000 Ohms
µF	microfarad (10^{-6} farad)
µs	microsecond (10^{-6} second)
µsec	microsecond (10^{-6} second)
A0, A1, etc.	Address 0, Address 1, etc.
AC	Alternating Current
ACC	Access
ACK	Acknowledge
AMP	Amplitude; Ampere
AMPL	Amplitude
AN	Anode
ASIC	Application-Specific Integrated Circuit
ATTN	Attention
B	Buffered
BANK FAN	Hammer Bank Fan
BCOM	Buffered Communication
BCP	Bi-phase Communications Processor
BHSC	Buffered Hammer Shift Clock
BN	Buffered, Low True
BNLD	Buffered, Low True, Lower Driver
BPS	Bits Per Second
BSY	Busy

BTU	British Thermal Unit
BUD	Buffered Upper Driver
CA	Cathode
CC	Card Cage
CCF	Card Cage Fan
CE	Customer Engineer
CHNG	Change
CIR	Circuit
CLK	Clock
CO	Cover Open
COLL	Collector
COMM	Communication
CONTLR	Controller
CMD	Command
CMX	The controller board
CNC	Connector, Connection
CPI	Characters Per Inch
CR	Carriage Return
CT	Coaxial/Twinaxial
CTL	Control
CTS	Clear to Send
CU	Control Unit
CUR	Current
D0, D1, etc.	Data Bit 0, Data Bit 1, etc.
DAT	Data
DC	Direct Current, Data Controller (a functional unit of the CMX controller board)
DCD	Data Carrier Detect
DIAG	Diagnostic
DIFF	Differential
DMA	Direct Memory Access
DP	Data Processing, Dataproducts
DPEN	Dataproducts Enable
DPMC	Dot Plucker Memory Controller
DPU	Data Processing Unit

DRAM	Dynamic Random-Access Memory
DRV	Drive or Driver
DRVR	Driver
DSR	Data Set Ready
DTR	Data Terminal Ready
EC	Engine Controller (a functional unit of the CMX controller board)
EEPROM	Electrically Erasable/Programmable Read-Only Memory
EHF	Exhaust Fan
EL	Elevator (stacker)
EMI	ElectroMagnetic Interference
EMIT	Emitter
EPROM	Electrically Programmable Read-Only Memory
ERR	Error
ESD	Electrostatic Discharge
EX	Exhaust, Extra
EXH	Exhaust
EXF	Exhaust Fan
EXP	Expansion
EXPND	Expand
FD	Feed
FF	Form Feed
FIFO	First In, First Out
FLT	Fault
FLTR	Filter
FP	Front Panel (Control Panel)
FTIC	Fire Timer Integrated Circuit
GND	Ground
HB	Hammer Bank
HBA	Hammer Bank ASIC
HBF	Hammer Bank Fan
HBL	Hammer Bank, Left
HBP	Hammer Bank Power

HBR	Hammer Bank, Right
HD	Hammer Driver
HDIC	Hammer Driver Integrated Circuit
HDPH	Hammer Driver Phase
HLP	Hammer Bank Logic, Signals, and Power
IC	Integrated Circuit
ID	Identification
IGP	Intelligent Graphics Printing
INST	Instruction
INT	Interrupt
I/O	Input/Output
IRQ	Interrupt Request
(J)	Jack connector
L	Left
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LF	Line Feed
LO	Low
LPI	Lines Per Inch
LPM	Lines Per Minute
LRIB	Left Ribbon
LRP	Left Ribbon Guide
M	Motor
MAIN	Maintenance Jack, RS-232 (Optional)
MECA	Mechanism Engine Control ASIC
MECH	Mechanism
MF	microfarad (10^{-6} farad)
MH	Mounting Hole, Main Harness
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
MOT	Motor
MPU	Magnetic Pick-Up (Unit)
ms	millisecond (10^{-3} second)

MSL	Motor and Sensors, Left
MSR	Motor and Sensors, Right
N	Negative True
N/C	Not Connected
NC	Not Connected
NLQ	Near Letter Quality
No.	Number
NOVRAM	Nonvolatile Random-Access Memory
ns	nanosecond (10^{-9} second)
NT	Not
NVRAM	Nonvolatile Random-Access Memory
OLV	On Line Verify
OP	Operand
P5	+ 5 V dc
(P)	Pin connector
P(1), P(2), etc.	Parallel data 1, data 2, etc.
PAL	Programmable Array Logic
PAP	Paper
PAPR	Paper
PARM	Parameter
PCBA	Printed Circuit Board Assembly
PCB	Printed Circuit Board
PD	Paper Detect(or)
PE	Printer Error, Paper Empty
PER	Peripheral Device
PF	Paper Feed, picofarad (10^{-12} farad)
PFM	Paper Feed Motor
PHA	Phase A
PHB	Phase B
PI	Paper Instruction
PLAT	Platen
PLM	Platen Motor
PLO	Platen Open (Switch)
PMD	Paper Motion Detect

PN	Pin or Plug
P/N	Part Number
PO	Paper Out
POD	Paper Out Detect (Switch)
PPR	Paper
PROM	Programmable Read-Only Memory
PS	Power Supply
PS5	Power Supply + 5 Volt
PSA	Printronix System Architecture
PTR	Pointer, Printer, Printronix
PWM	Pulse Width Modulation
PWR	Power
R	Right
RBN	Ribbon
RD	Read
RET	Return
RIB	Ribbon
RG	Ribbon Guide
RGL	Ribbon Guide, Left
RGR	Ribbon Guide, Right
RM	Ribbon Motor
RML	Ribbon Motor, Left
RMR	Ribbon Motor, Right
RQ	Request
RRIB	Right Ribbon
RRP	Right Ribbon Guide
RSP	Ribbon and Shuttle Processor
RST	Reset
RTS	Request to Send
RXD	Receive Data
SCS	SNA Character Stream
SEC	Security (Key)
SEL	Select
SEN	Sense, Sensor
SF	Structured Field

SG	Signal Ground
SHH	Shuttle Hall (Effect)
SHM	Shuttle Motor
SHUT	Shuttle
SHUTL	Shuttle
SIMM	Single Inline Memory Module
SLCT	Select (On-line)
Slew	Rapid vertical paper movement
SMD	Shuttle Motor Drive
SNA	Systems Network Architecture
SPU	Shuttle Processor Unit
SRAM	Static Random-Access Memory
STAT	Status or State
STBY	Standby
STK	Stacker
SW	Switch
SYNC	Synchronize
TCB	Task Control Block
TEMP	Temperature
TOF	Top of Form (first print line)
TP	Test Point
TTL	Transistor-Transistor Logic
TXD	Transmit Data
UART	Universal Asynchronous Receiver/Transmitter
UDPH	Upper Drive Phase
UNDEF	Undefined
USART	Universal Synchronous/Asynchronous Receiver/ Transmitter
V	Volts
V_{CC}	Voltage at Collector
V_{DD}	Voltage at Drain
V_{SS}	Voltage at Source
VX	A special ASIC on the CMX controller board containing circuits that help the DC controller operate. The initials VX do not signify words; they serve only to identify this ASIC.

WR	Write
w/	With
w/o	Without
XMT	Transmit

C Metric Conversion Tables

Length

Multiply	By	To Obtain
foot	0.3048*	meter (m)
foot	30.48*	centimeter (cm)
foot	304.8*	millimeter (mm)
inch	0.0254*	meter (m)
inch	2.54*	centimeter (cm)
inch	25.4*	millimeter (mm)
meter	3.280840	foot
centimeter	0.03280840	foot
millimeter	0.003280840	foot
meter	39.37008	inch
centimeter	0.3937008	inch
millimeter	0.03937008	inch

* Figure is exact.

Torque and Force

Multiply	By	To Obtain
pound-inch	0.11298	Newton-meter (N•M)
pound-foot	1.3558	Newton-meter (N•M)
Newton-meter (N•M)	8.8511	pound-inch
Newton-meter (N•M)	0.7376	pound-foot
pound	4.4482	Newton (N)
Newton (N)	0.22481	pound

Mass and Density

Multiply	By	To Obtain
pound*	0.4535924	kilogram (kg)
ounce*	28.34952	gram (g)
kilogram	2.204622	pound*
gram	0.03527393	ounce*

* avoirdupois

Temperature

To Convert	To	Use Formula
temperature Celsius (t_c)	temperature Fahreheit (t_f)	$t_f = 1.8\ t_c + 32$
temperature Fahreheit (t_f)	temperature Celsius (t_c)	$t_c = (t_f - 32) / 1.8$

Power

Multiply	By	To Obtain
Btu (International Table)/ hour	0.2930711	watt (W)
watt (W)	3.412141	Btu (International Table)/ hour
watt (W)	0.001359621	horsepower (metric)
horsepower (metric)	735.499	watt (W)

D *Noise Suppression Devices*

Ferrite noise suppressors are installed in the printer to reduce radio frequency interference (RFI) to and from electronic equipment located near the printer.

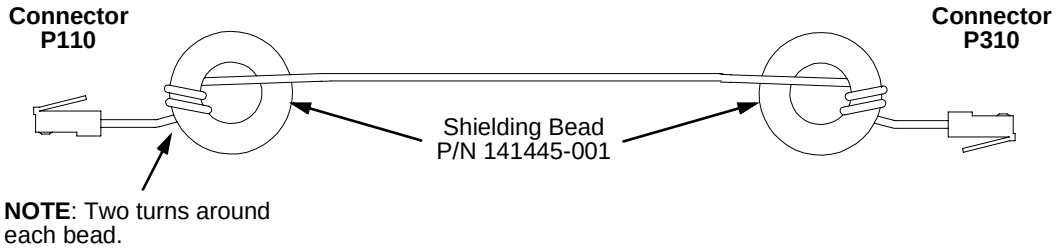
Two kinds of ferrite noise suppressors are used:

1. Shielding Bead (P/N 141445-001) is a cylindrical core, through and around which the control panel cable assembly is wound. Two are required.
2. Ferrite Clamp (P/N 202049-001) is a noise suppression core in a hinged plastic case and attached to the wall of the card cage with adhesive. The parallel I/O cable assembly passes through this core.

Figure 55 shows how these devices are installed.

IMPORTANT **Duplicate the number of turns around the shielding beads when installing or replacing the control panel cable. See Figure 55.**

Control Panel Cable Assembly



Parallel I/O Cable Assembly

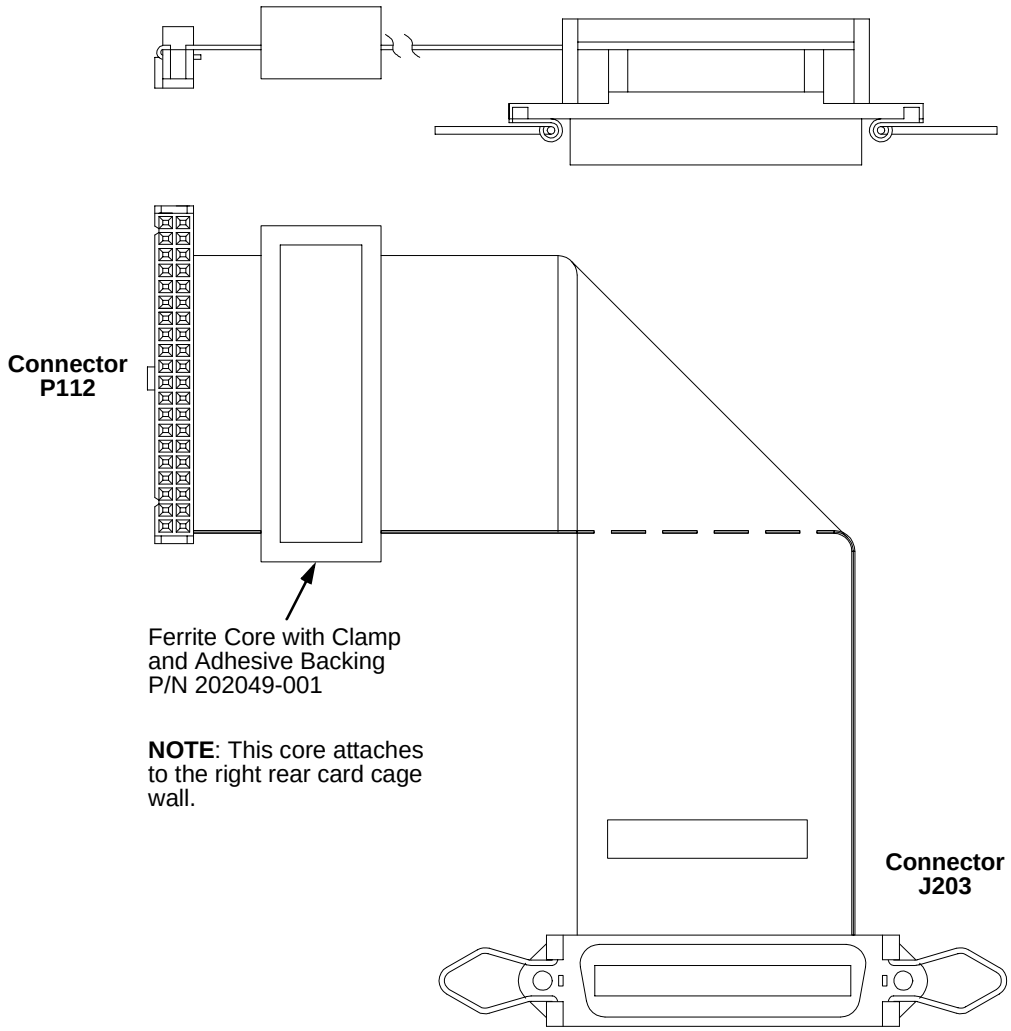


Figure 55. Ferrite Core Installation

E SureStak™ Power Stacker

Contents

Introduction: page 311

Removing the Power Stacker: page 312

Installing the Power Stacker: page 317

Replacement Procedures:

- Constant Force Spring: page 328
- Timing Belts: page 331

Illustrated Parts Breakdown: page 335

Introduction

The SureStak Power Stacker is a factory-installed option for cabinet model printers.

Most of the stacker assembly is inside the cabinet, so you must remove the stacker assembly from the printer in order to service it or replace most of its components.

The powered paper stacker is designed to work with forms from 5 to 12 inches (12.7 to 30.5 cm) long. Using longer or shorter paper can cause error messages and unpredictable behavior of the stacker.

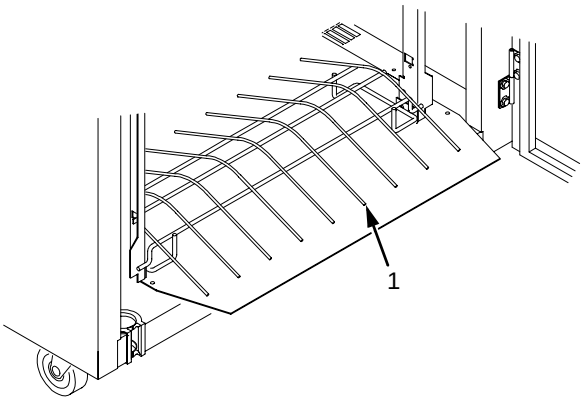
This appendix has two parts:

- Removal/installation instructions for the power stacker assembly and components that require the most frequent replacement.
- An illustrated parts breakdown (IPB) showing how the entire power stacker unit is assembled. The IPB also lists the part numbers for replaceable parts.

NOTE: Only replaceable parts have part numbers in the IPB. If you need to replace a part for which no part number is shown, replace the entire power stacker assembly.

Removing the Power Stacker

1. Set the printer power switch to O (off).
2. Unplug the power cord.
3. Unload paper from the stacker area. (Refer to the *User's Guide.)*
4. Remove the paper tent. (See Figure 56.)

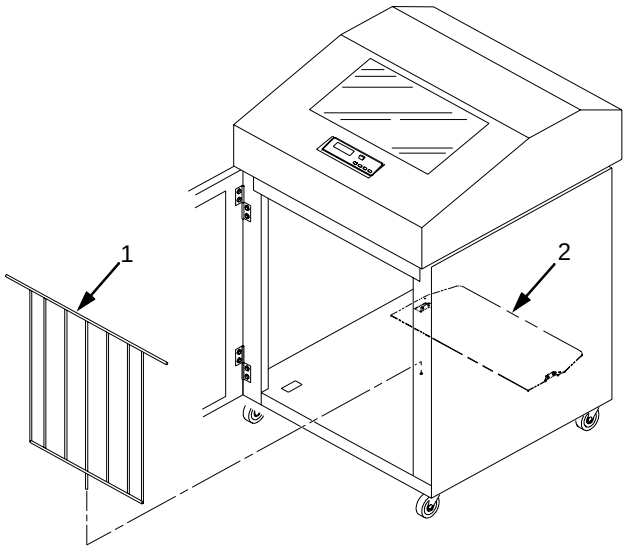


Legend:

1. Paper Tent

Figure 56. Removing the Paper Tent

5. Cut the tie wrap and remove the paper fence. (See Figure 57.)

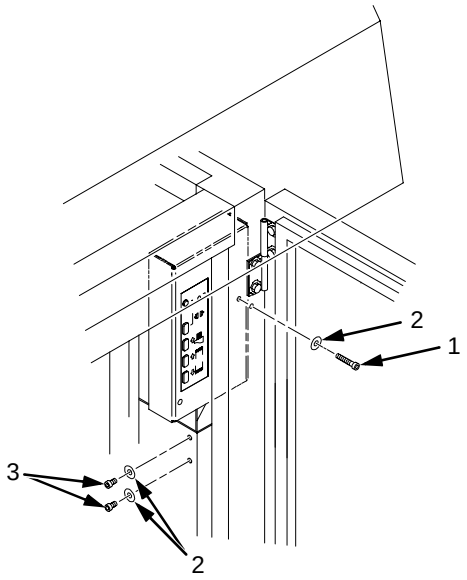


Legend:

1. Paper Fence
2. Stacker Base

Figure 57. Removing the Paper Fence

6. Remove three screws and washers from the stacker control panel. (See Figure 58.)

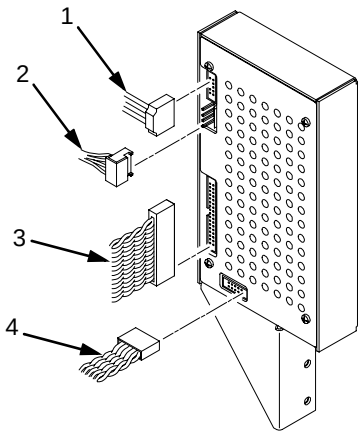


Legend:

1. Long Screw
2. Washer
3. Short Screw

Figure 58. Removing the Stacker Control Panel

7. Remove four cables from the stacker control panel, and remove the stacker control panel. (See Figure 59.)

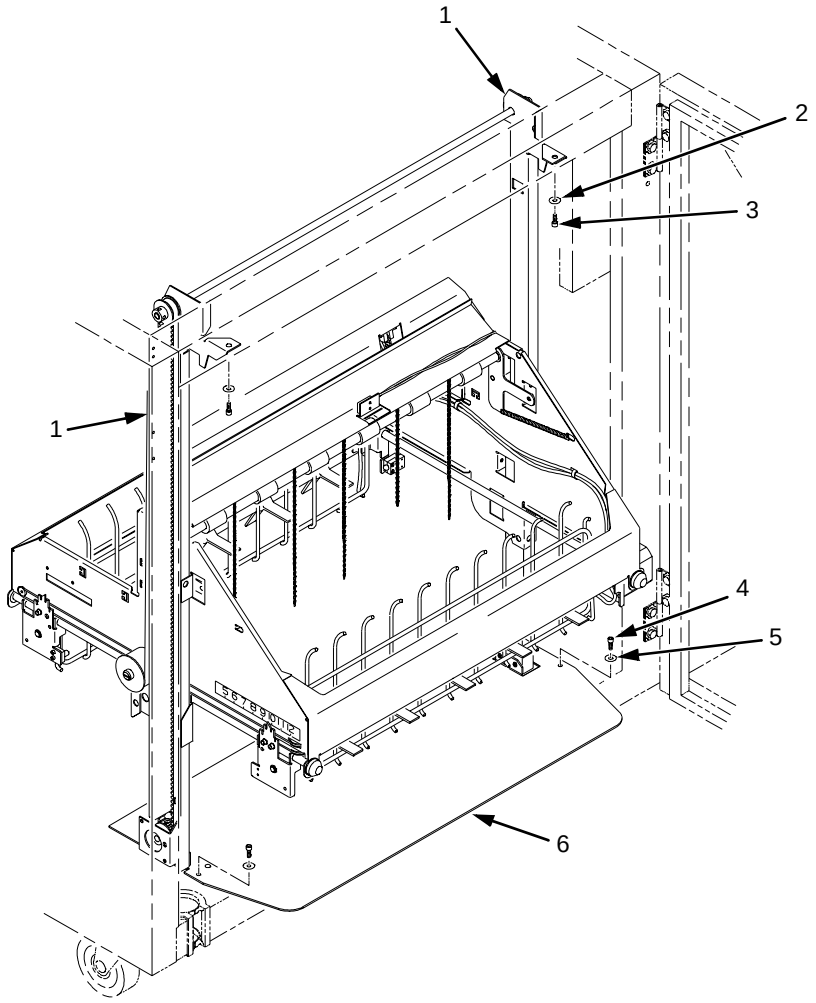


Legend:

1. Logic Cable (P104)
2. Power Cable
3. Frame Cable (P102)
4. Rail Cable (P107)

Figure 59. Removing Cables from the Stacker Control Panel

8. Remove the two 5/32 x 3/4 inch screws and washers securing the vertical rails to the upper frame cross-member at the rear of the cabinet. (See Figure 60.)
9. Raise the elevator assembly.

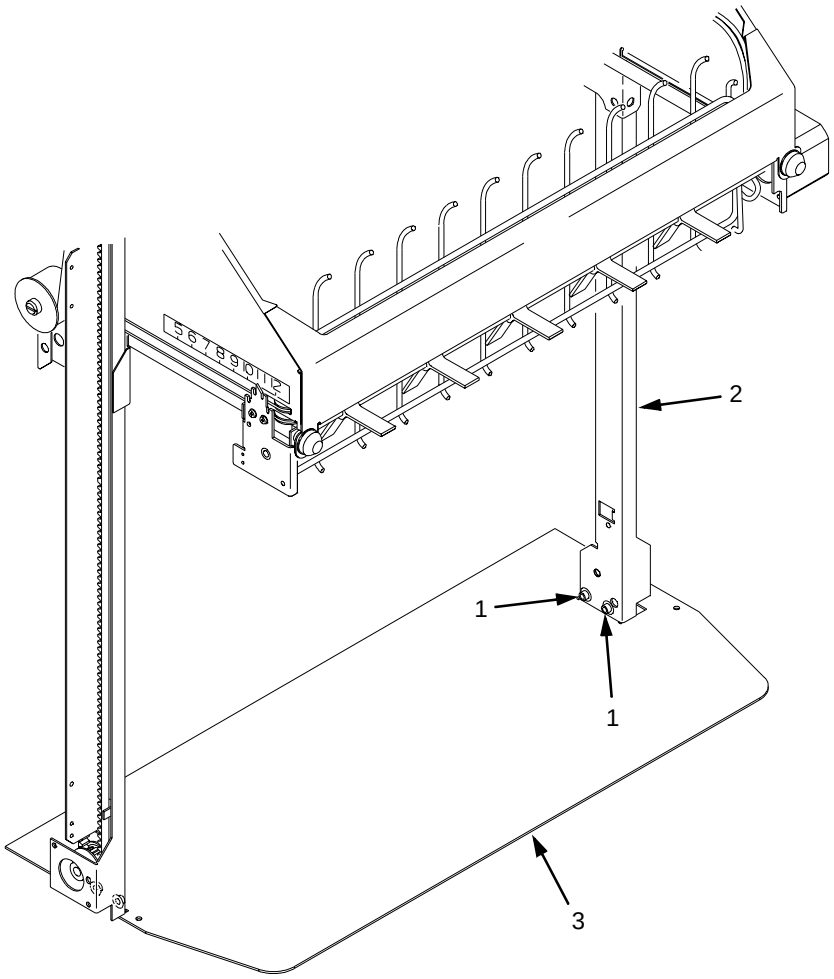


Legend:

1. Vertical Rail
2. Washer (2)
3. Screw, 5/32 x 3/4 inch (2)
4. Screw, 7/64 x 1/2 inch or Torx T-10 (2)
5. Washer (2) but no washers with Torx T-10 screws
6. Stacker Base

Figure 60. Preparing the Stacker for Removal

10. Loosen one turn—do not remove—the Torx T-10 screws securing the vertical rails to the stacker base. Each rail is secured by two screws. (See Figure 61.)

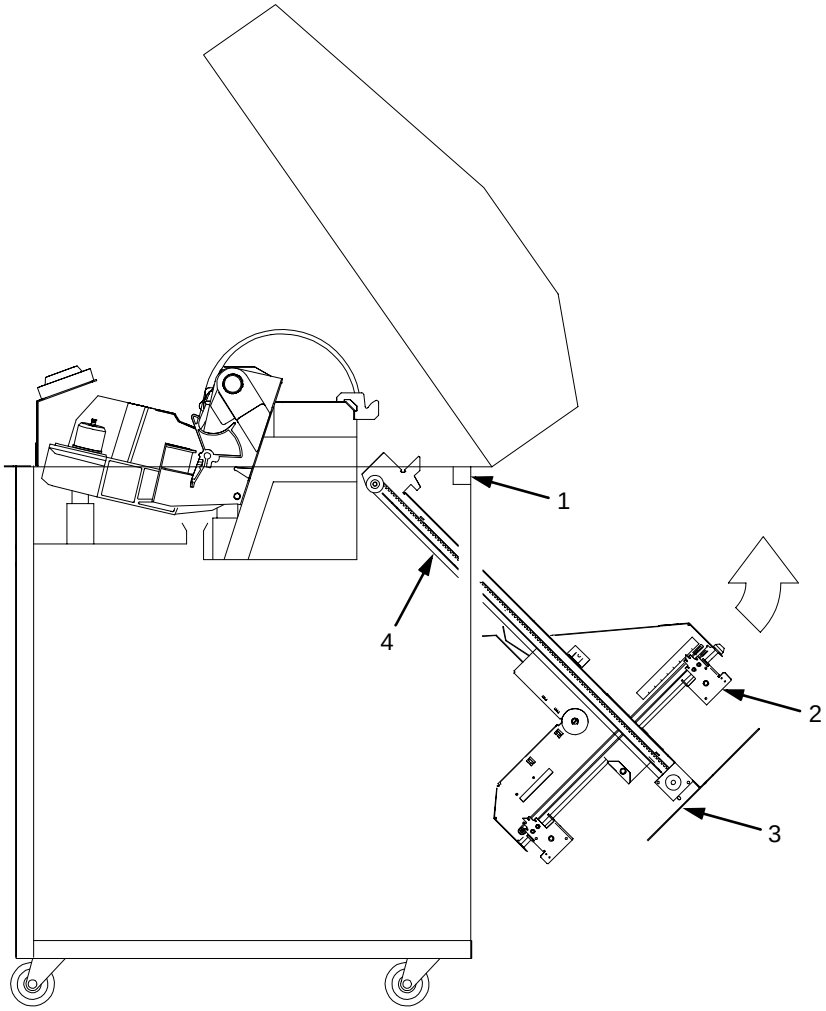


Legend:

1. Screw, 6-32x1/4, Torx T-10: two at bottom of each rail
2. Vertical Rail
3. Stacker Base

Figure 61. Loosening the Lower Screws in the Vertical Rails

11. Remove the 7/64 x 1/2 inch screws and washers (or Torx T-10 screws) securing the base plate to the cabinet floor. (See Figure 60.)
12. Lower the elevator assembly to its lowest position.
13. Slide the stacker assembly slightly to the right to clear the air exhaust duct. Tilt the vertical rails toward the front of the printer until they clear the upper frame cross-member. Slide the stacker assembly to rear and angle it out of the cabinet, as shown in Figure 62.



Legend:

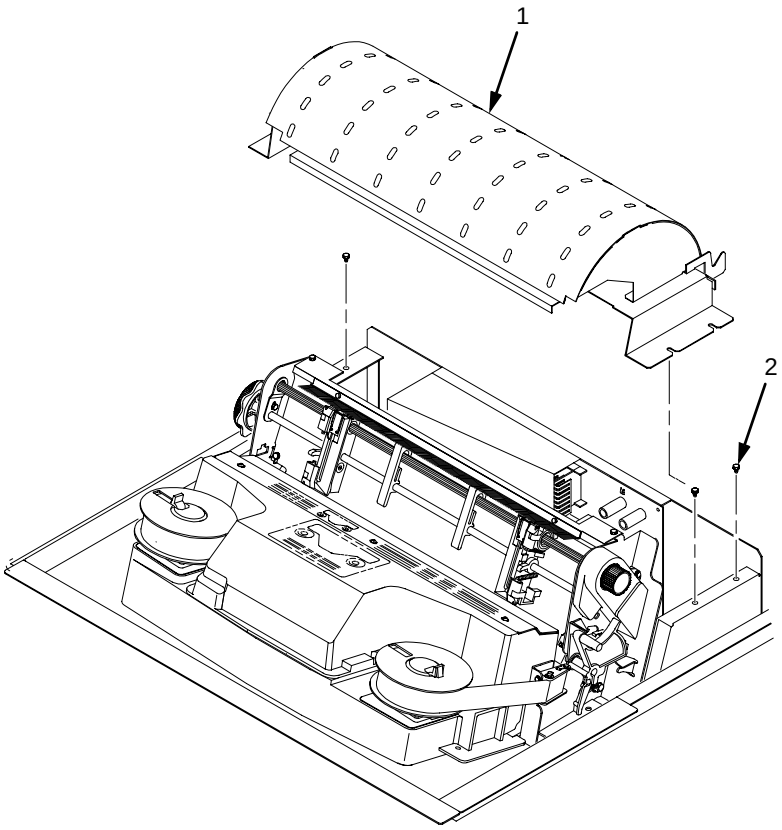
1. Upper Frame Cross-Member
2. Elevator Assembly
3. Stacker Base
4. Vertical Rail

Figure 62. Removing the Stacker Assembly

Installing the Power Stacker

NOTE: This procedure is for complete installation of the power stacker, including cable assemblies and the stacker control panel.

1. Set the printer power switch to O (off).
2. Unplug the power cord.
3. Remove paper.
4. Loosen the three paper path hold-down screws. Slide the paper path to the left and lift it off the card cage. (See Figure 63.)

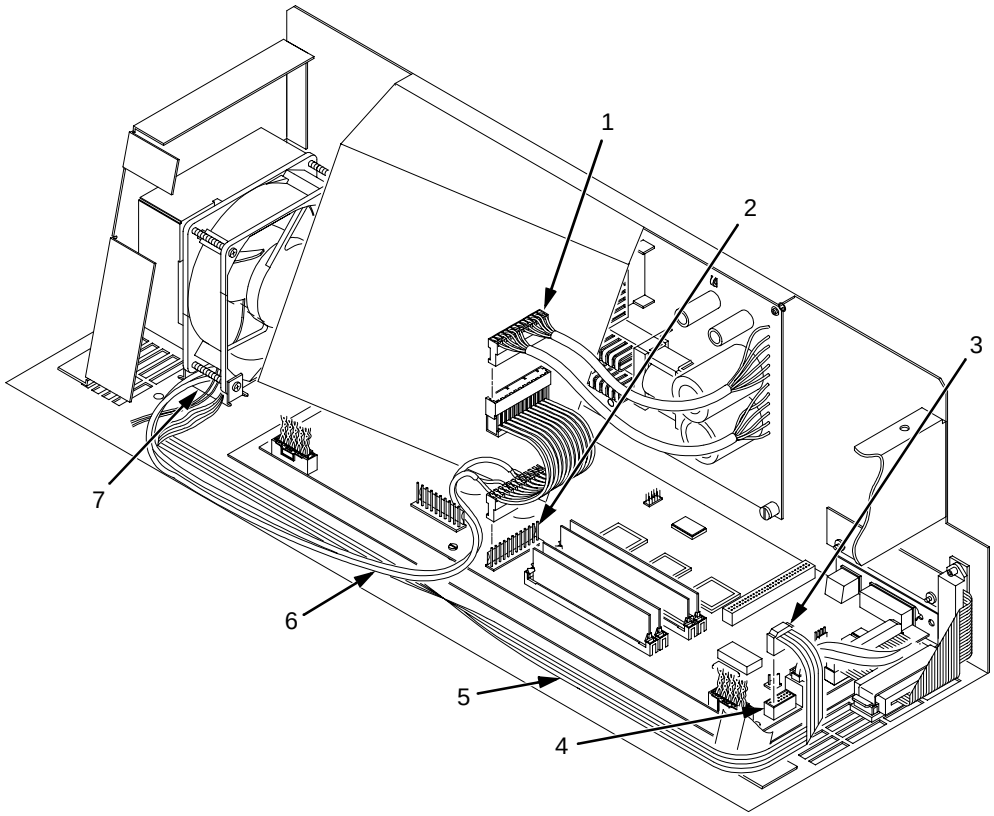


Legend:

1. Paper Path
2. Hold-Down Screw (3)

Figure 63. Remove the Paper Guide

5. Connect the power stacker logic cable P103 to connector J17 on the CMX controller board. (See Figure 64.)
6. Disconnect the power supply cable from connector J101 on the CMX controller board. (See Figure 64.)
7. Connect power supply cable connector P101 to the stacker power cable, then connect the stacker power cable to connector J101 on the CMX controller board. (See Figure 64.)
8. Route the stacker power cable and the stacker logic cable in front of the CMX board and through the cutout beneath the card cage fan, as shown in Figure 64.



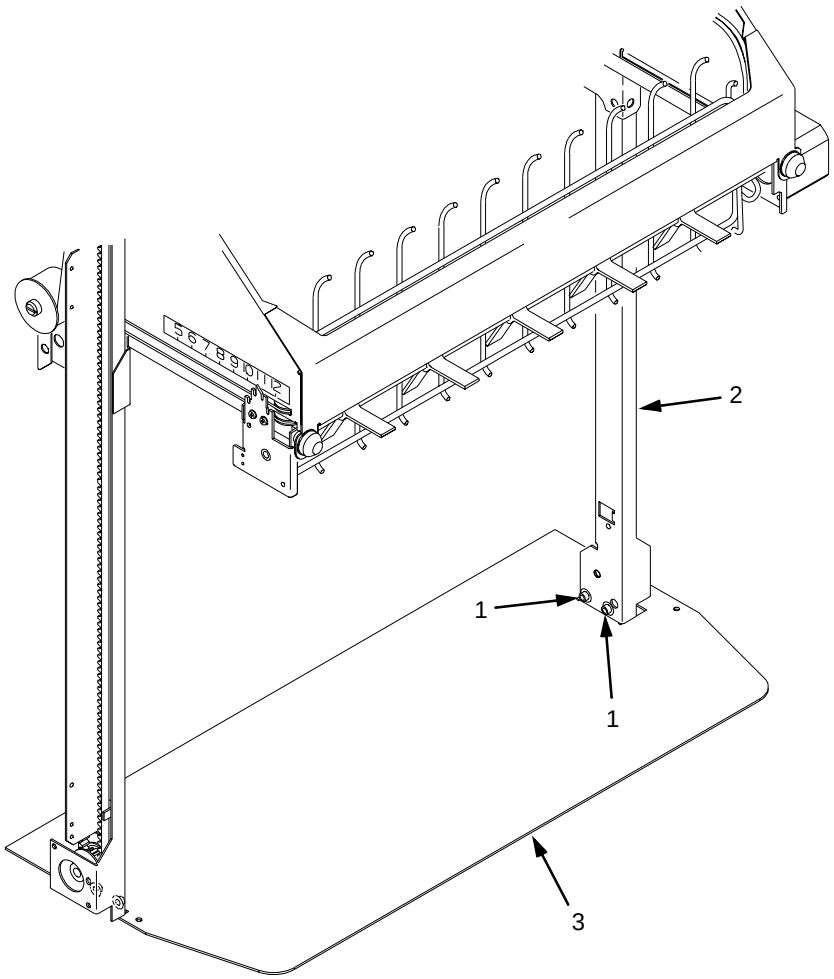
Legend:

1. Power Supply Connector P101
2. CMX Board Connector J101
3. Connector P103
4. CMX Board Connector J17
5. Stacker Logic Cable
6. Stacker Power Cable
7. Cutout Beneath Card Cage Fan

Figure 64. Stacker Power and Logic Connections on the CMX Controller Board

CAUTION **The paper stacker assembly mounts to the rear upper frame cross-member and the cabinet floor. It is a snug fit. During installation, take care to avoid scratching painted surfaces or damaging the stacker.**

9. Loosen one turn—do not remove—the Torx T-10 screws securing the vertical rails to the stacker base. Each rail is secured by two screws. (See Figure 65.)

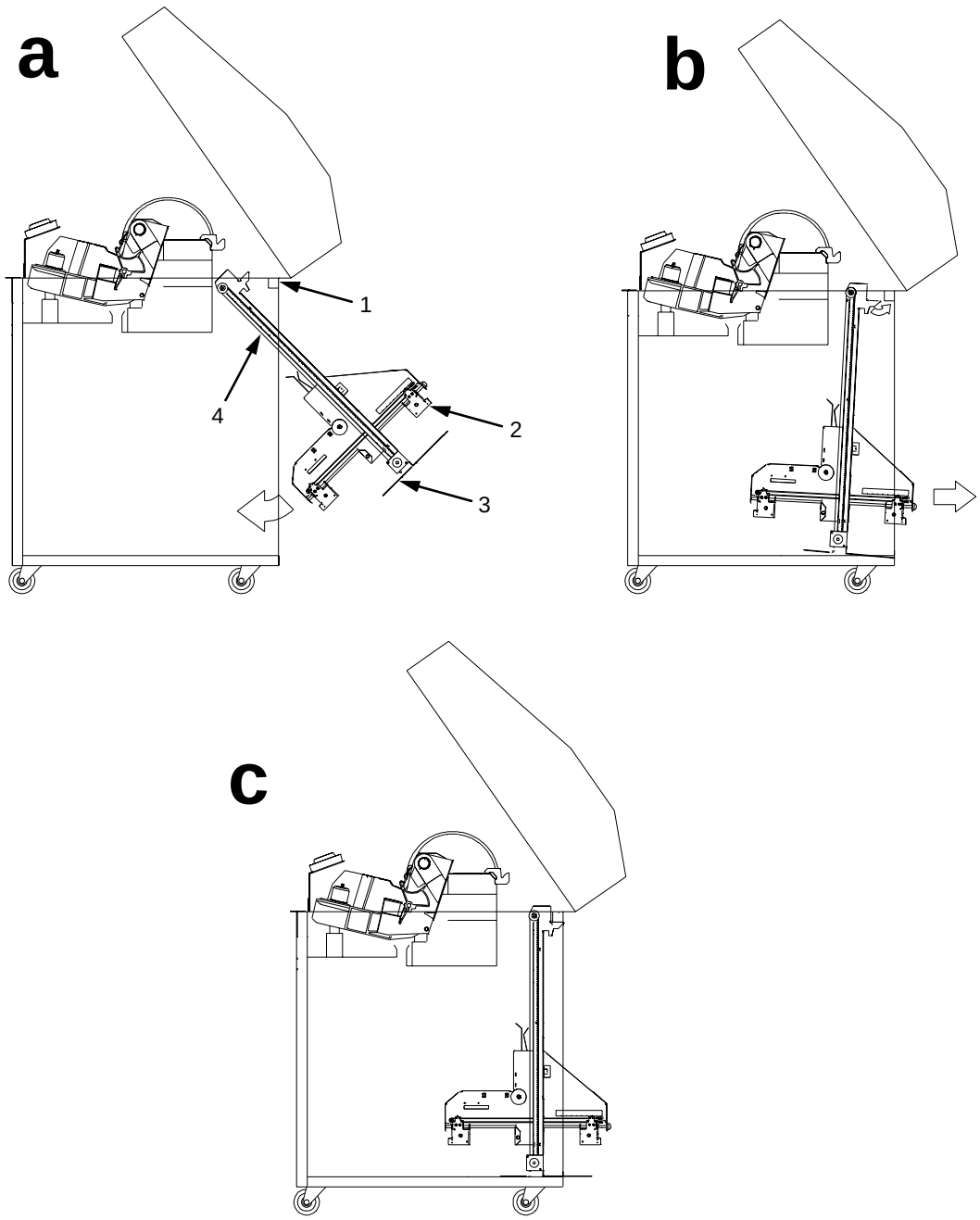


Legend:

1. Screw, 6-32x1/4, Torx T-10
2. Vertical Rail
3. Stacker Base

Figure 65. Loosening the Lower Screws in the Vertical Rails

10. Position the elevator assembly at the bottom of the vertical rails. (See Figure 66a.)
11. Position the stacker assembly slightly to the right in order to clear the air exhaust duct, insert the vertical rails inside and under the upper frame cross-member, then slowly swing the base of the stacker assembly into the cabinet. (See Figure 66a.)
12. Work the stacker base rearward and engage the upper brackets of the vertical rails under the upper frame cross-member. (See Figure 66b.)
13. Align the holes in the vertical rail brackets with the holes in the upper frame cross-member. (See Figure 66c and Figure 67.)

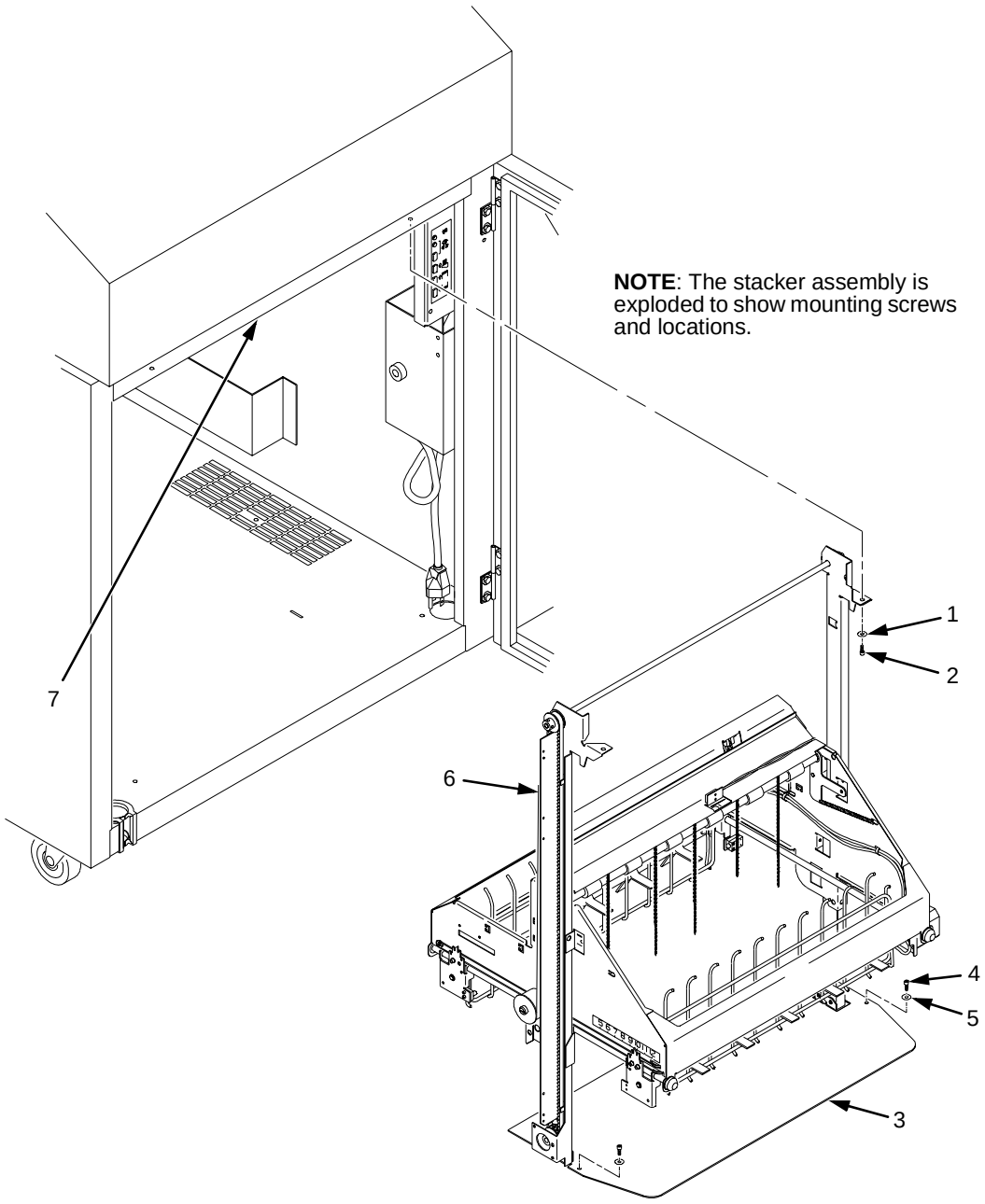


Legend:

1. Upper Frame Cross-Member
2. Elevator Assembly
3. Stacker Base
4. Vertical Rail

Figure 66. Stacker Installation

14. Align the holes in the stacker base with the holes in the cabinet floor. (See Figure 66c and Figure 67.)
15. Install finger tight the two 5/32 x 3/4 inch screws and washers securing the vertical rails to the upper frame cross-member.
16. Install and tighten the 7/64 x 1/2 inch screws and washers (or Torx T-10 screws) securing the stacker base to the cabinet floor. (See Figure 67.)
17. Move the elevator assembly up and down on the vertical rails until it travels smoothly with no binding.
18. Tighten the two 5/32 x 3/4 inch screws and washers securing the vertical rails to the upper frame cross-member.
19. Move the elevator assembly up and down again to make sure it travels smoothly with no binding.
20. Tighten the screws securing the vertical rails to the stacker base. Each rail is secured by two screws. (See Figure 65.)
21. Move the elevator assembly up and down to make sure it travels smoothly with no binding. If the elevator binds or catches anywhere along its path of travel, slightly loosen the upper and lower rail screws and repeat steps 17 through 20 until the elevator moves smoothly.

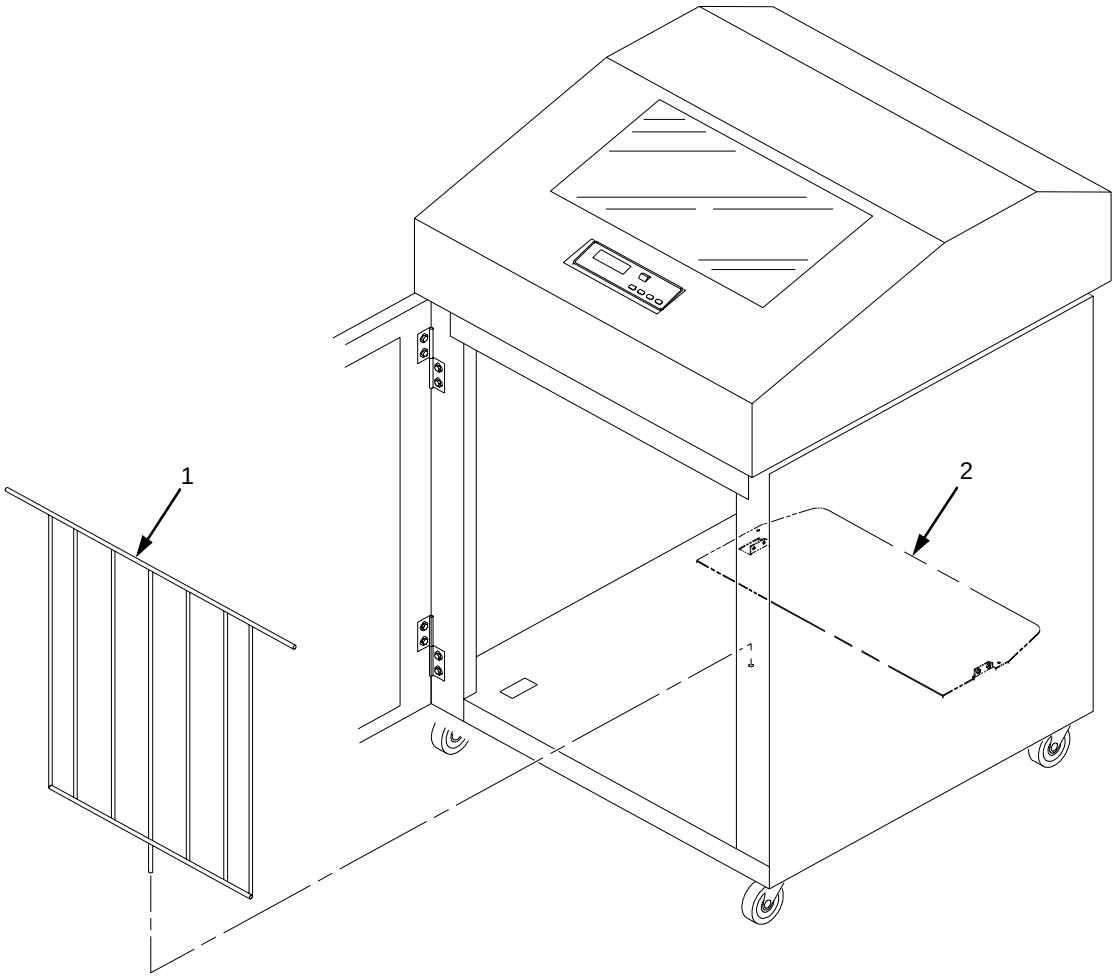


Legend:

1. Washer (2)
2. Screw, 5/32 x 3/4 inch (2)
3. Stacker Base
4. Screw, 7/64 x 1/2 inch or Torx T-10 (2)
5. Washer (2) but no washers with Torx T-10 screws
6. Vertical Rail
7. Upper Frame Cross-Member

Figure 67. Stacker Fasteners

22. Install the paper fence. (See Figure 68.)

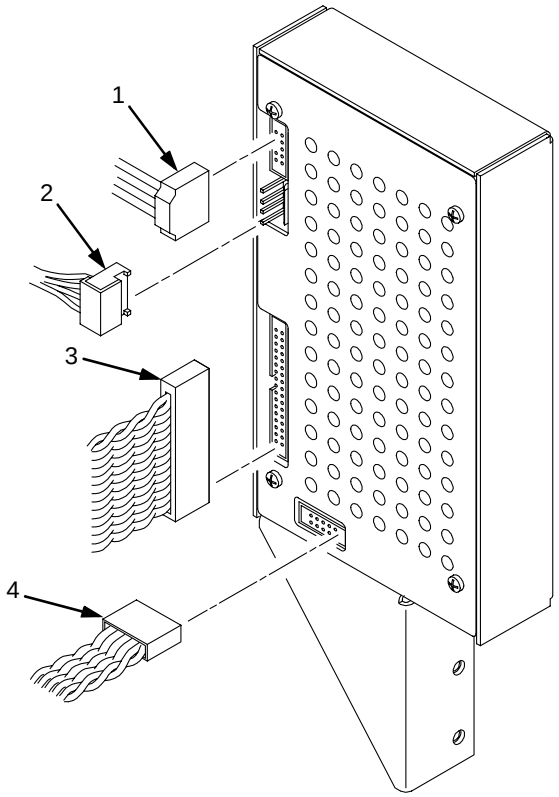


Legend:

1. Paper Fence
2. Stacker Base

Figure 68. Paper Fence

23. Gather the rail cable, frame cable, logic cable, and power cable. Route the cables outboard of the elevator assembly.
24. Connect the stacker cables to the rear of the stacker control panel assembly, as shown in Figure 69.

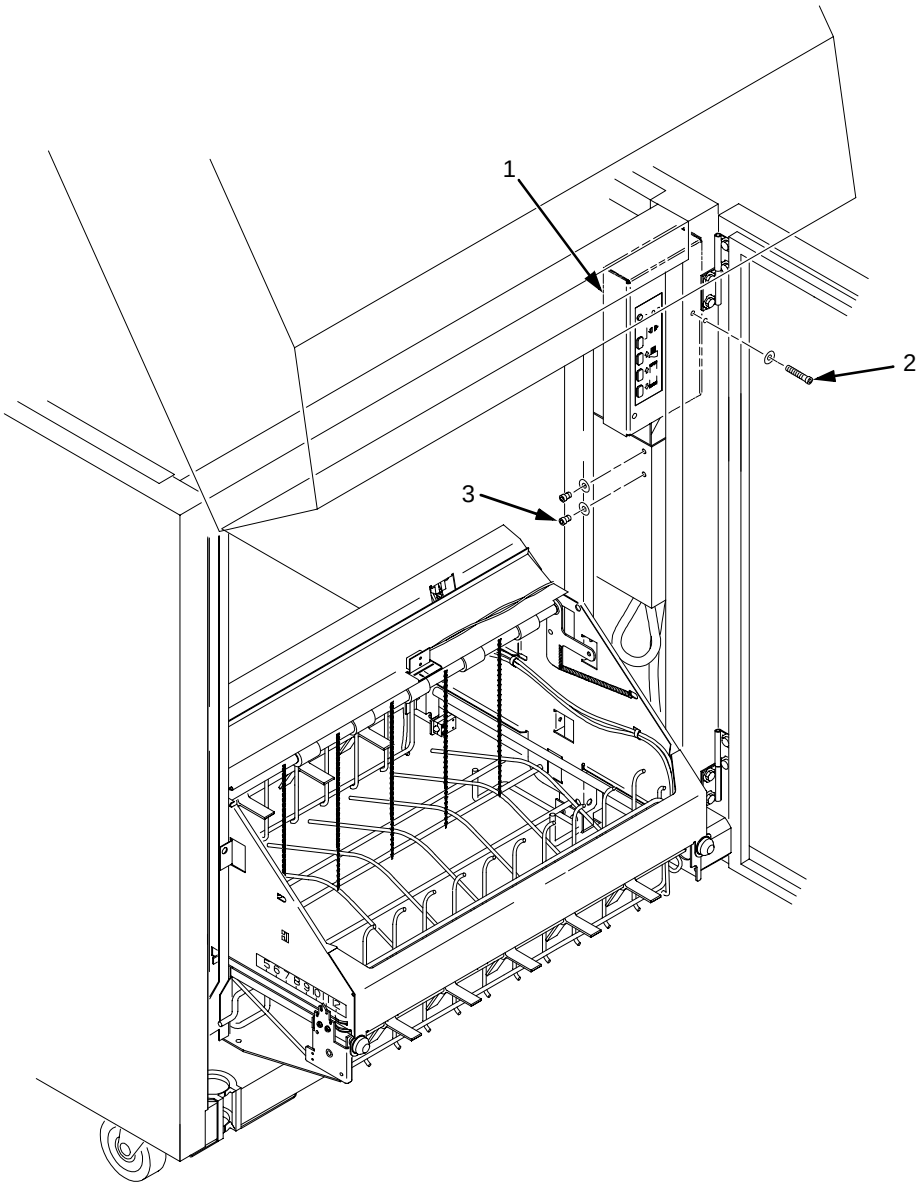


Legend:

1. Logic Cable (P104)
2. Power Cable
3. Frame Cable (P102)
4. Rail Cable (P107)

Figure 69. Stacker Control Panel Cables

25. Position the stacker control panel as shown in Figure 70, and install the mounting screws.

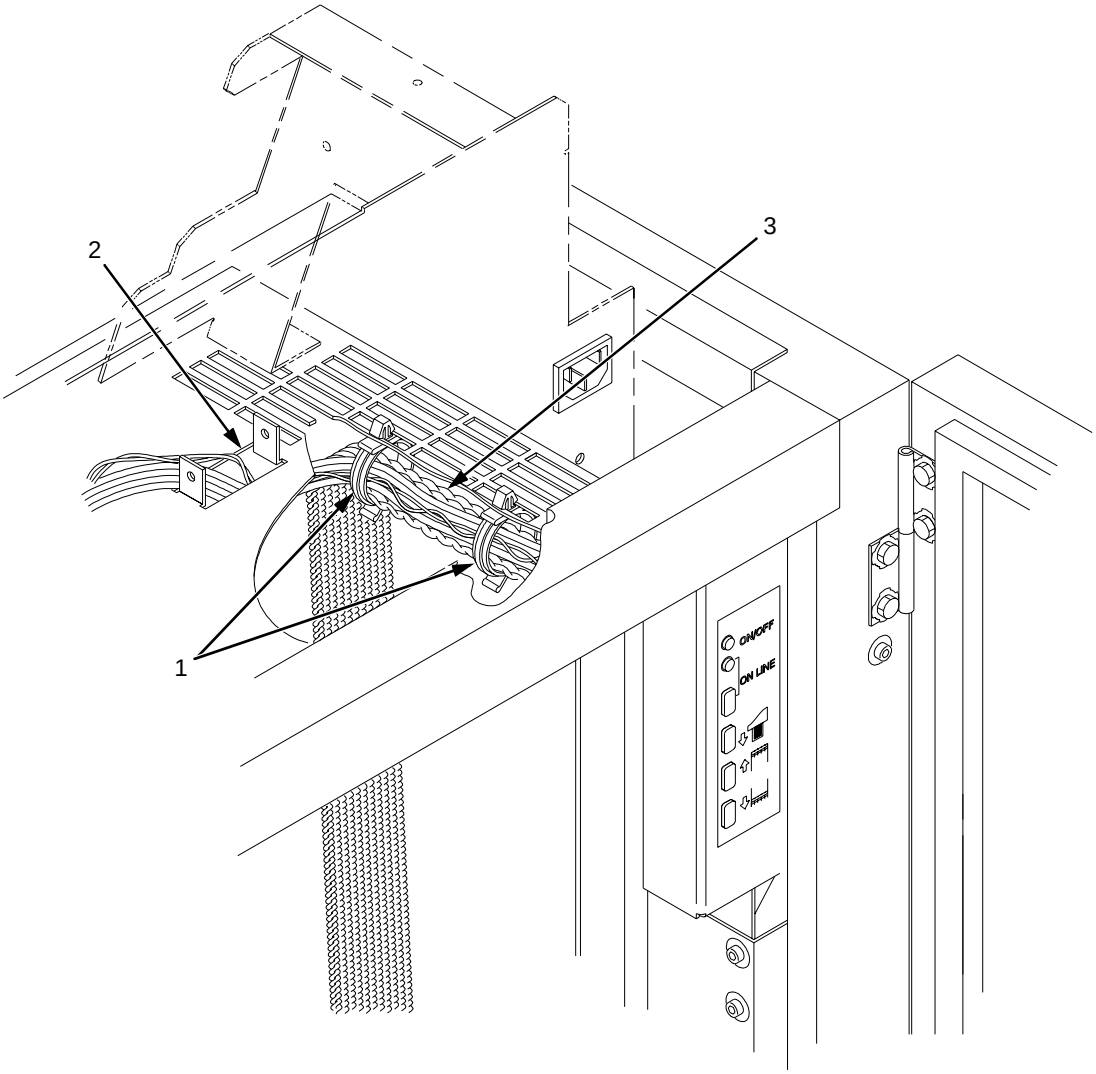


Legend:

1. Stacker Control Panel
2. Long Screw
3. Short Screw (2)

Figure 70. Installing the Stacker Control Panel

26. Bundle the stacker control panel cables in the wire harness clips located under the card cage. (See Figure 71.) Tie wrap the cables so they do not catch in the stacker mechanism as it moves up and down. Route the stacker rail and frame cables so they move without snagging as the elevator assembly moves up and down.



Legend:

1. Wire Saddle (2)
2. Cutout Beneath Card Cage Fan
3. Cable Bundle

Figure 71. Securing Stacker Cables

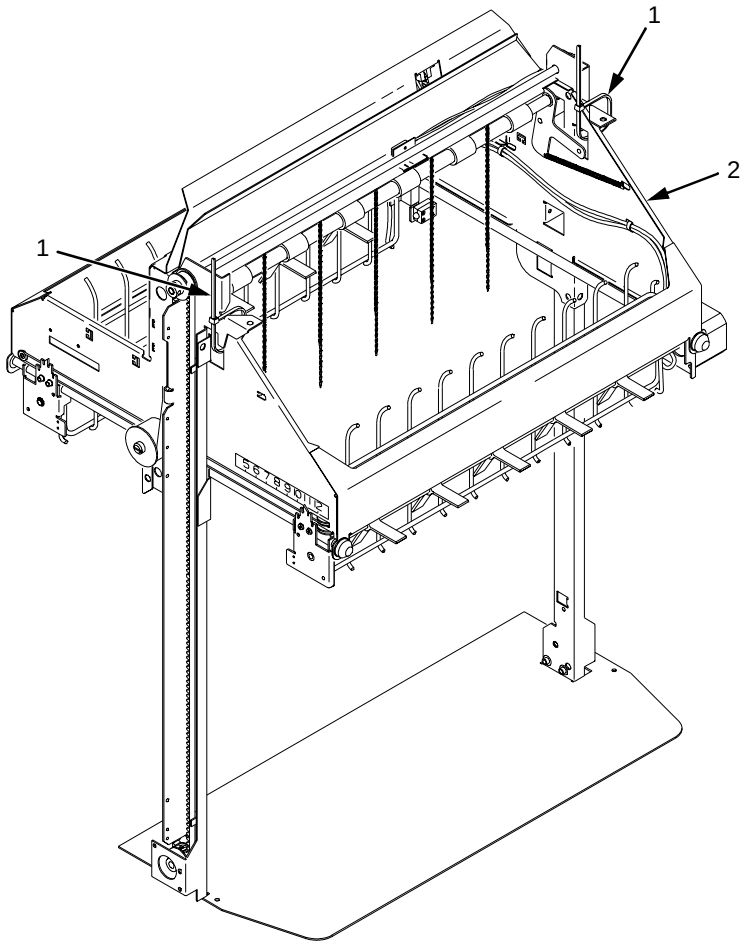
27. Install the paper path that you removed in step 4.
28. Install paper and test stacker operation. (Refer to the *User's Guide.)*

Replacing the Constant Force Spring

1. Remove the stacker assembly from the printer. (See page 312.)

CAUTION **In the next step, do not over-tighten the tie wraps or string. Tighten the tie wraps or string just enough to hold the elevator up.**

2. Raise the elevator assembly to its highest position and secure it to the vertical rails using tie wraps or string. (See Figure 72.)



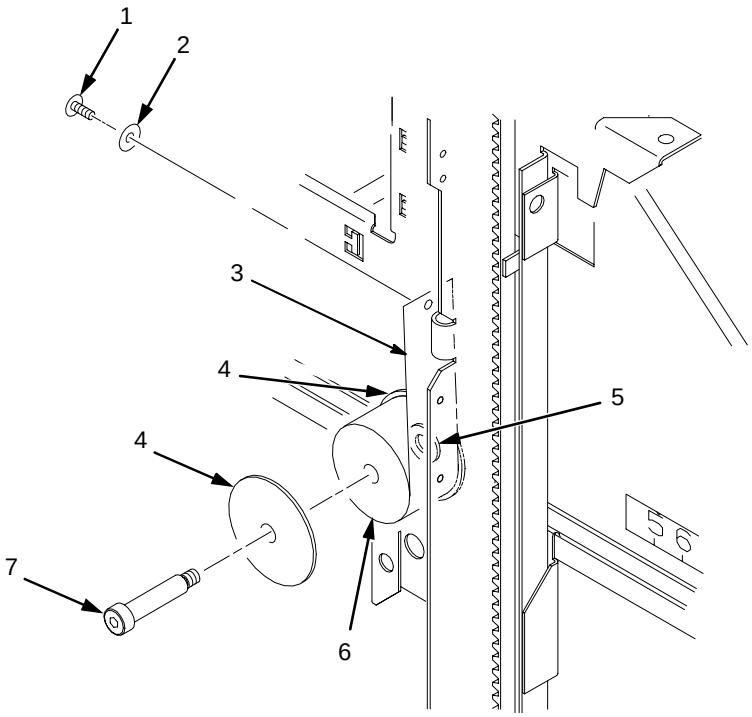
Legend:

1. Tie Wrap
2. Elevator Assembly

Figure 72. Securing the Elevator Assembly

WARNING **The constant force spring is a high tension spring. To avoid pinching your fingers, coil the spring slowly and carefully. Do not let the spring twist or crimp.**

3. Remove the shoulder screw, washers, and spacer from the constant force spring and drum. Let the spring coil itself up until it reaches the screw that secures it to the vertical rail. (See Figure 73.)
4. Firmly gripping the spring and drum, remove the screw securing the spring to the vertical rail. (See Figure 73.)

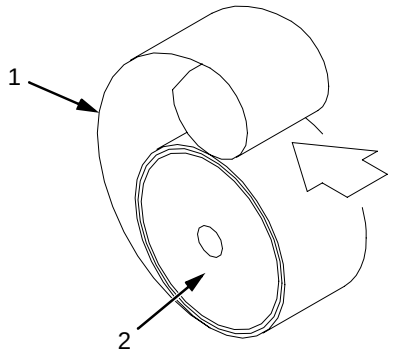


Legend:

1. Rail Screw
2. Washer
3. Constant Force Spring
4. Large Washer
5. Spacer
6. Drum
7. Shoulder Screw

Figure 73. Removing the Constant Force Spring

5. Lift the loose end of the constant force spring and let it curl up on the outside of the remaining spring and drum. (See Figure 74.)
6. While holding the drum tightly, continue to curl the spring until it is completely unwound from the drum. (See Figure 74.)
7. To install a new constant force spring, reverse the steps of this procedure.



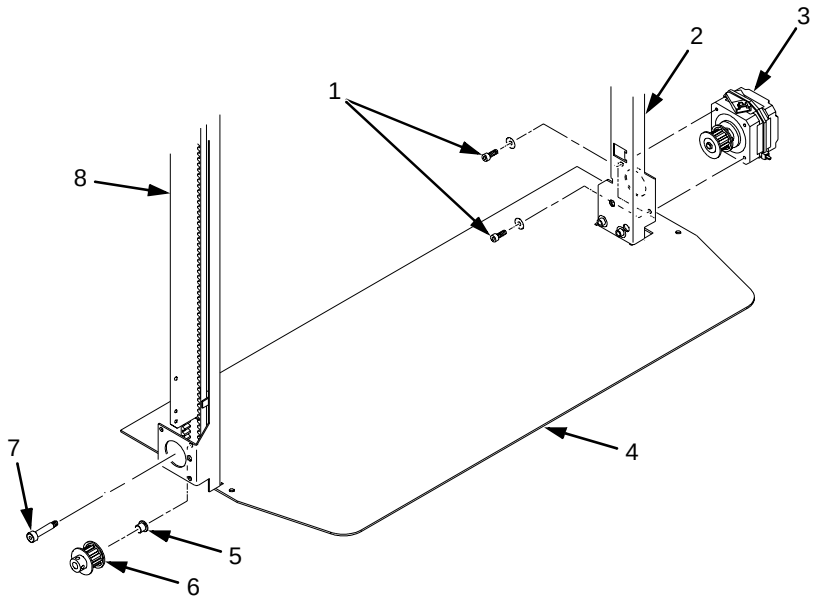
Legend:

1. Spring
2. Drum

Figure 74. Removing the Constant Force Spring from the Drum

Replacing the Timing Belts

1. Remove the stacker assembly from the printer. (See page 312.)
2. Raise the elevator assembly to its highest position and secure it to the vertical rails using tie wraps or string. (See Figure 72, page 328.)
3. If you are removing the left timing belt, remove the shoulder screw from the pulley at the bottom of the left vertical rail, and remove the pulley. (See Figure 75.) Go to step 6.
4. If you are removing the right timing belt, remove the two metric Allen screws that secure the timing belt motor to the right vertical rail. (See Figure 75.) Go to step 5.

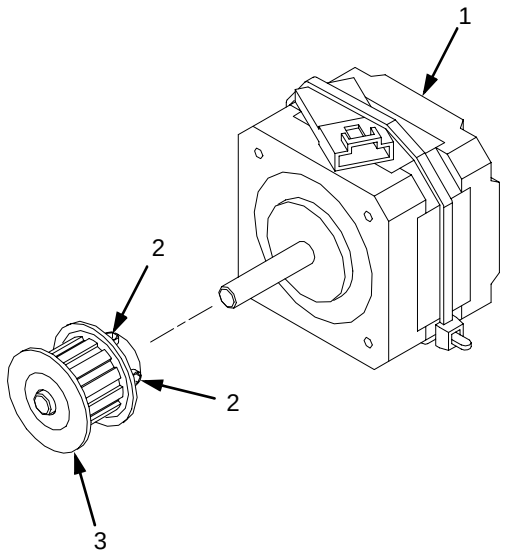


Legend:

1. Metric Allen Screw and Washer
2. Right Vertical Rail
3. Timing Belt Motor
4. Stacker Base
5. Bushing
6. Pulley
7. Shoulder Screw
8. Left Vertical Rail

Figure 75. Removing the Timing Belt Pulley and Motor

5. Loosen the two setscrews on the motor pulley and remove the pulley. Unplug the motor cable, if necessary. (See Figure 76.) Go to step 6.

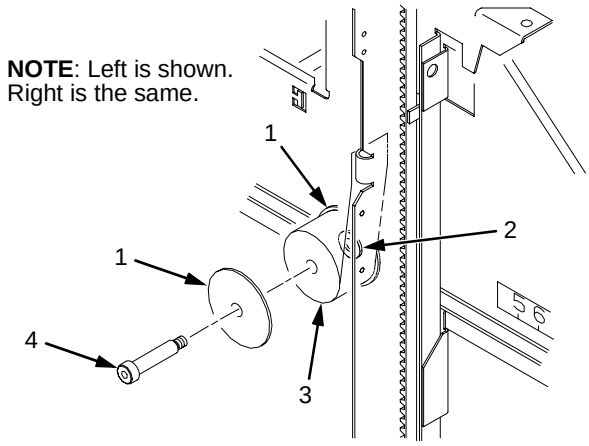


Legend:

1. Timing Belt Motor
2. Setscrew
3. Pulley

Figure 76. Removing the Timing Belt Motor Pulley

6. Remove the shoulder screw, washers, and spacer that secures the constant force spring to the vertical rail. (See Figure 77.)

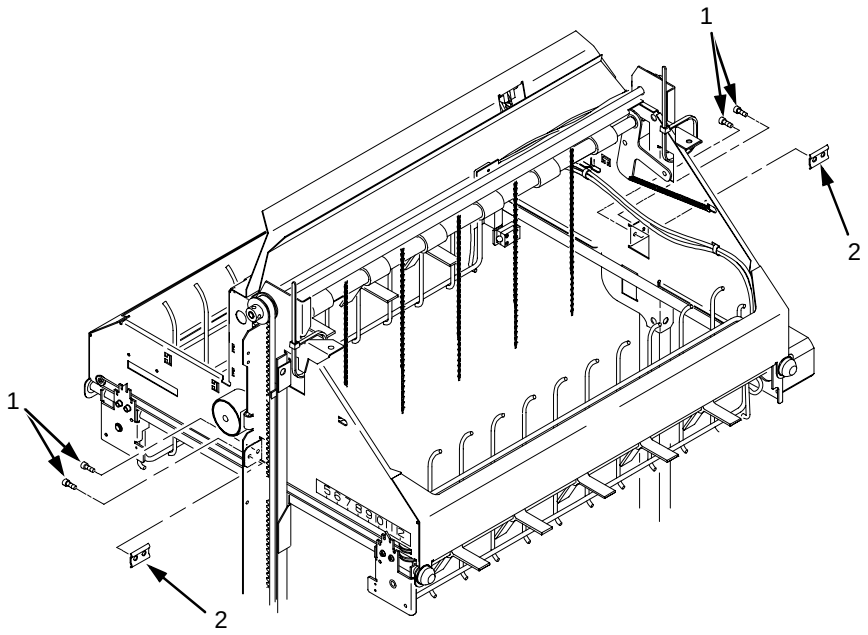


Legend:

1. Large Washer
2. Spacer
3. Constant Force Spring
4. Shoulder Screw

Figure 77. Releasing the Constant Force Spring

7. Remove two Allen screws from the belt clamp that secures the timing belt to the stacker frame. (See Figure 78.)

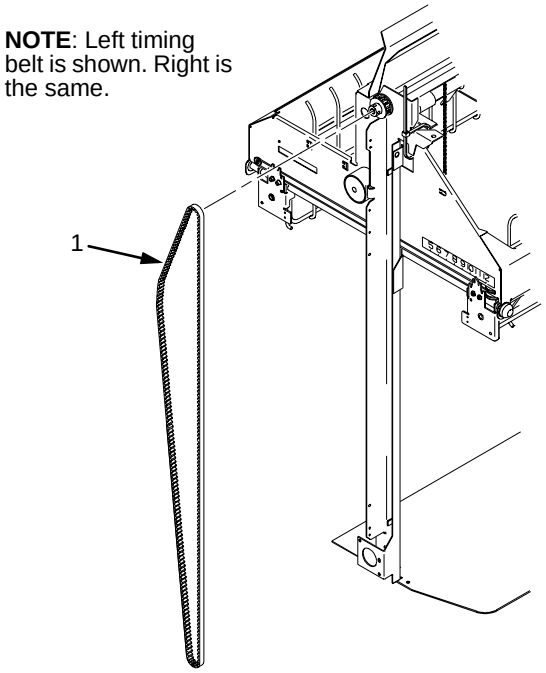


Legend:

1. Allen Screw
2. Belt Clamp

Figure 78. Removing the Belt Clamps

8. Remove the timing belt by working it around the vertical rail and constant force spring. (See Figure 79.)



Legend:

1. Timing Belt

Figure 79. Removing the Timing Belt

9. To install a timing belt, reverse the steps of this procedure.

Illustrated Parts Breakdown

The Illustrated Parts Breakdown (IPB) consists of exploded drawings of the power stacker assembly and subassemblies. Each drawing also has a list of replaceable parts.

Only replaceable parts are assigned part numbers. If a part or assembly is damaged but does not have a part number, replace the entire power stacker assembly.

The IPB starts on the next page.

Detail: Figure 81, page 338.

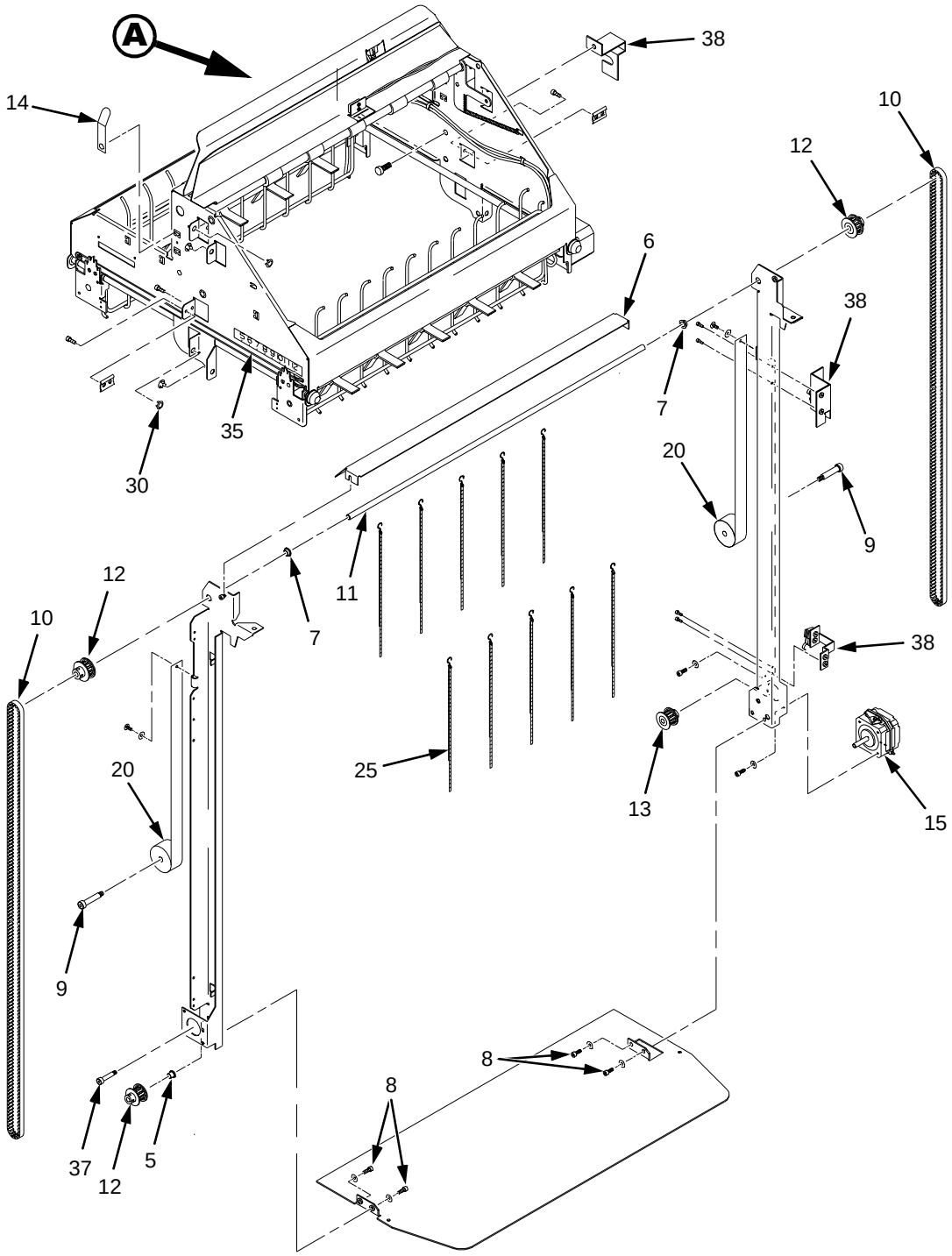


Figure 80. Stacker Assembly

Item No.	Part No.	Description	Notes
5	202706-904	Flanged Bearing	Part of item 36
6	158342-001	Paper Deflector	
7	202721-901	Clip-On Bearing	Part of item 36
8	Ref	Screw, Torx, 6-32 x .25	Part of item 36
9	Ref	Screw, Shoulder, 10-32	Part of item 36
10	202716-001	Timing Belt	
11	156388-001	Shaft, Lift	
12	163992-001	Pulley, Timing Belt	
13	159398-001	Pulley, Motor	
14	150784-001	Clip, Grounding	
15	158446-001	Motor	
20	202713-001	Constant Force Spring	
25	151527-905	Chain	Mount chains outboard of shafts
30	202705-901	Nylon Plug	
35	202720-901	Cable	
36	164405-001	Stacker Hardware Kit	Kit not illustrated
37	Ref	Screw, Shoulder, 8-32	Part of item 36
38	170285-001	Power Stacker Limit Switch Field Kit	
	158732-901	Control Panel Assembly	Figure 69, page 325
	158442-001	Rail Cable, Power Stacker	See page 294
	158443-001	Power Cable, Power Stacker	See page 293
	158444-001	Logic Cable, Power Stacker	See page 292
	Ref	Frame Cable, Power Stacker	See page 291

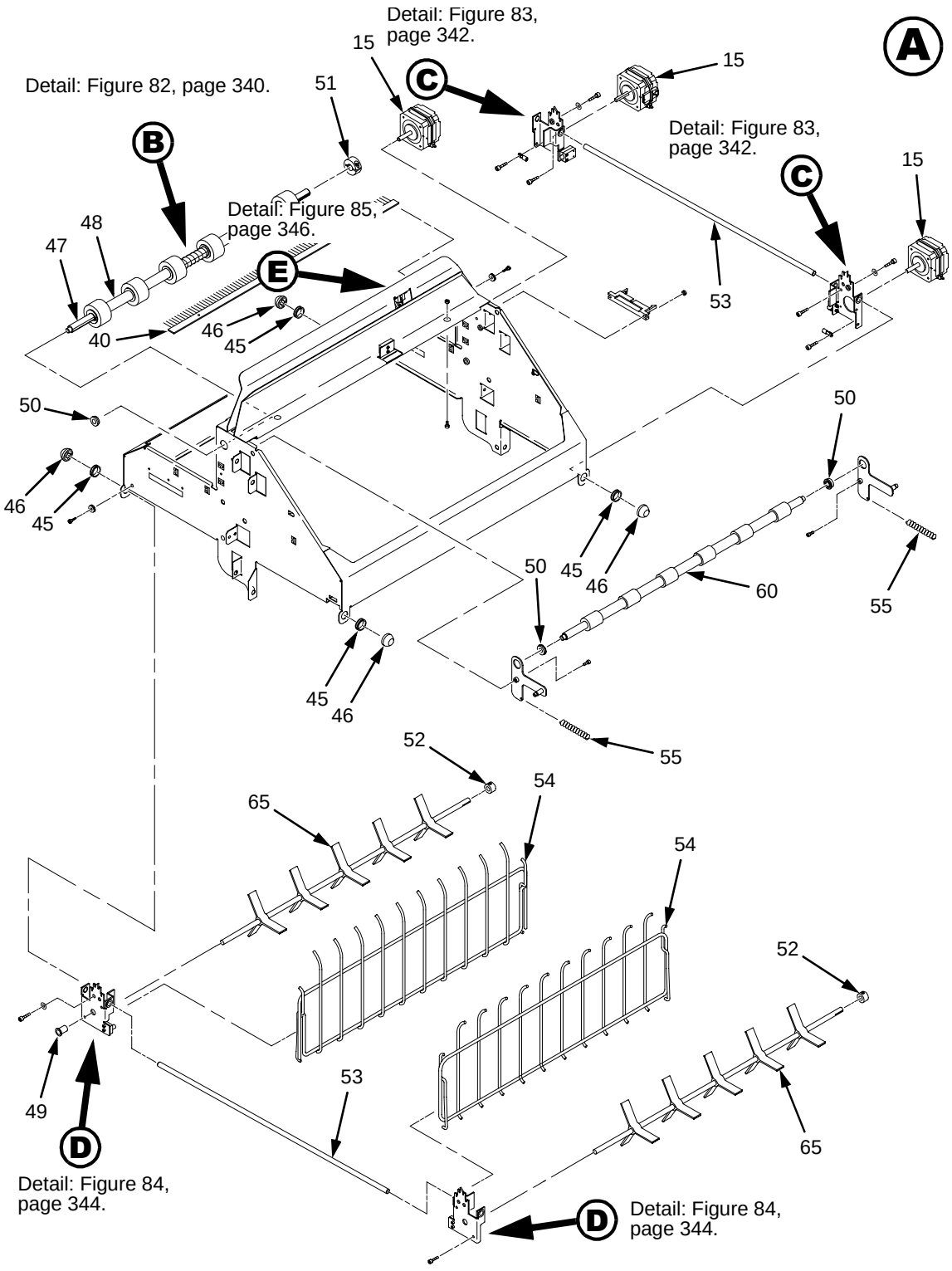


Figure 81. Elevator Detail: Motor, Roller, and Paddle Assemblies

Item No.	Part No.	Description	Notes
15	158446-001	Motor	
36	164405-001	Stacker Hardware Kit	Kit not illustrated
40	158313-001	Anti-Static Brush	
45	Ref	Shear Grommet	Part of item 36
46	Ref	Cap Nut	Part of item 36
47	156391-001	Shaft, Drive Roller	
48	156393-001	Spacer, Drive Roller	
49	202789-901	Bearing, Flanged	Part of item 36
50	202824-901	Bearing	Part of item 36
51	202708-001	Collar Clamp	
52	Ref	Collar, Setscrew	Part of item 36
53	156390-001	Support Shaft	
54	157598-001	Fence, Wireform	
55	203032-001	Extension Spring	
60	157275-001	Idler Roller	Five on early models
65	157054-001	Paddle, Power Stacker, P5XXX	

From Figure 81, page 338.

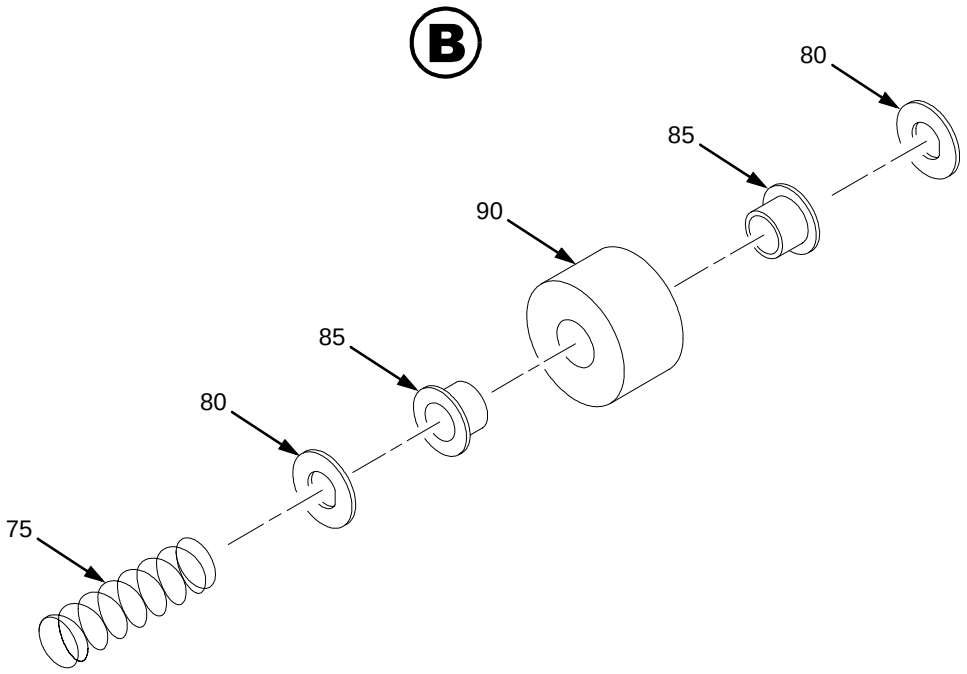


Figure 82. Stacker Detail: Rollers

Item No.	Part No.	Description	Notes
36	164405-001	Stacker Hardware Kit	Kit not illustrated
75	159425-001	Compression Spring	On left end of shaft on early models
80	156392-901	Friction Washer	Part of item 36
85	Ref	Flanged Bushing	Part of item 36
90	157960-001	Drive Roller	Five on early models

From Figure 81, page 338.

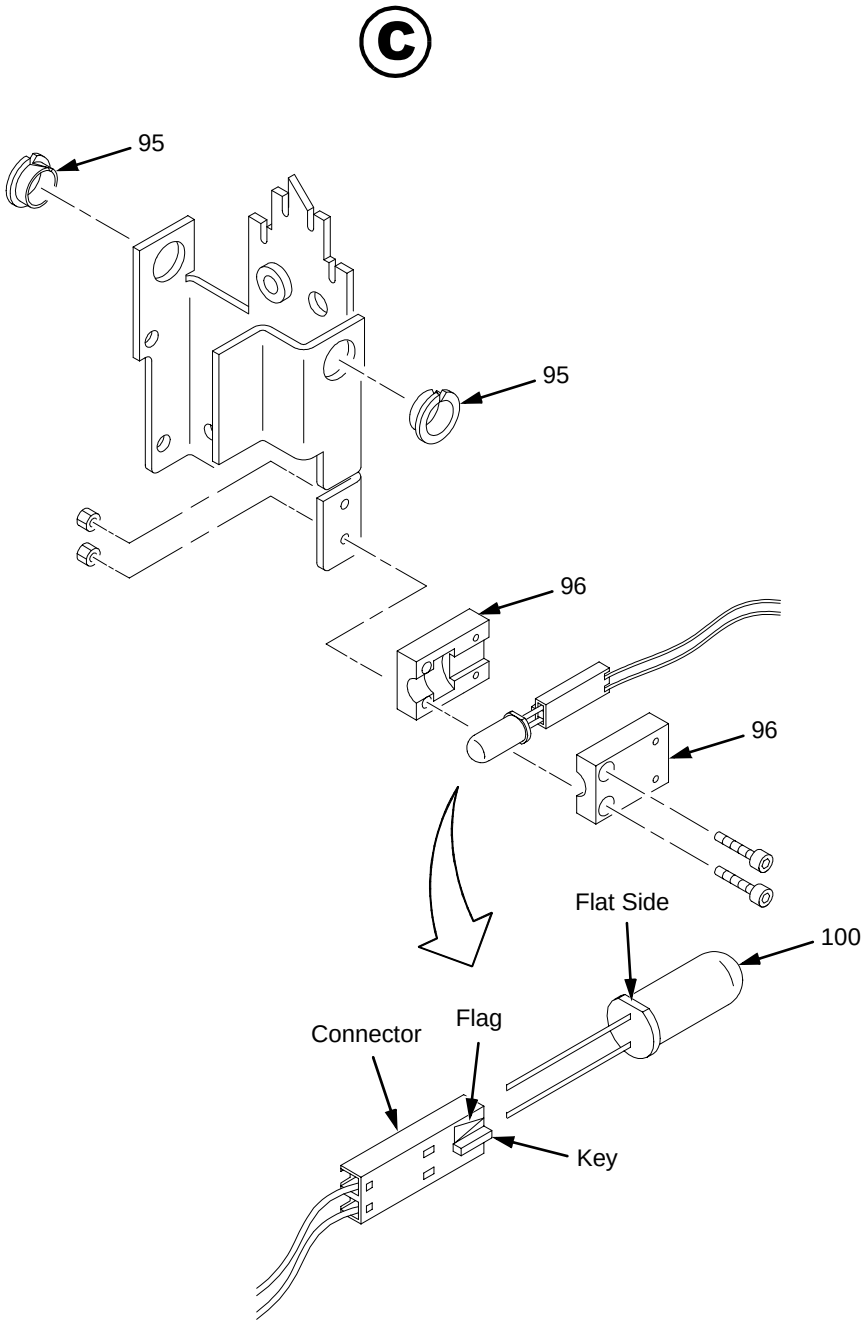


Figure 83. Stacker Detail: Motor Bracket

Item No.	Part No.	Description	Notes
36	164405-001	Stacker Hardware Kit	Kit not illustrated
95	Ref	Clip-On Bearing	Part of item 36
96	158288-001	Holder, LED, Round	
100	202727-001	LED, IR, T-1, 3/4	

From Figure 81, page 338.

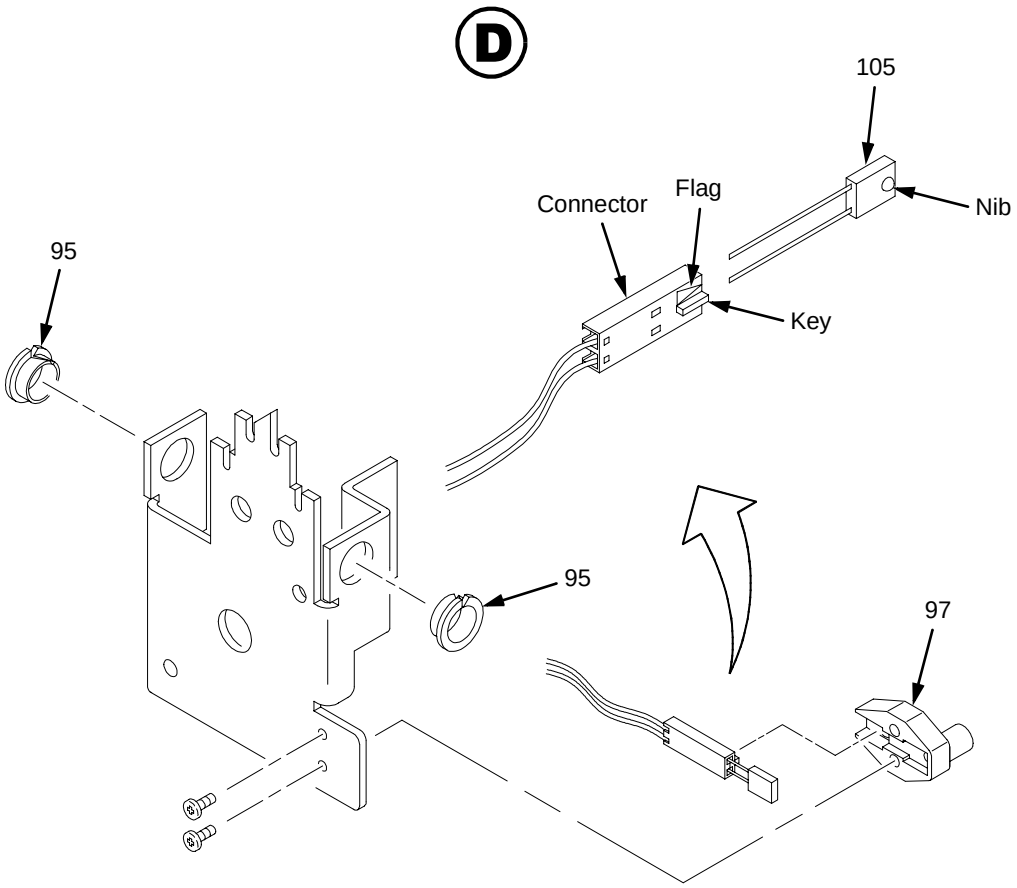


Figure 84. Stacker Detail: Elevator Bracket

Item No.	Part No.	Description	Notes
36	164405-001	Stacker Hardware Kit	Kit not illustrated
95	Ref	Clip-On Bearing	Part of item 36
97	158290-001	Holder, LED, Flat	
105	202728-001	Photodarlington, NPN, Rectifier	

From Figure 81, page 338.

E

Rotated 180 Degrees

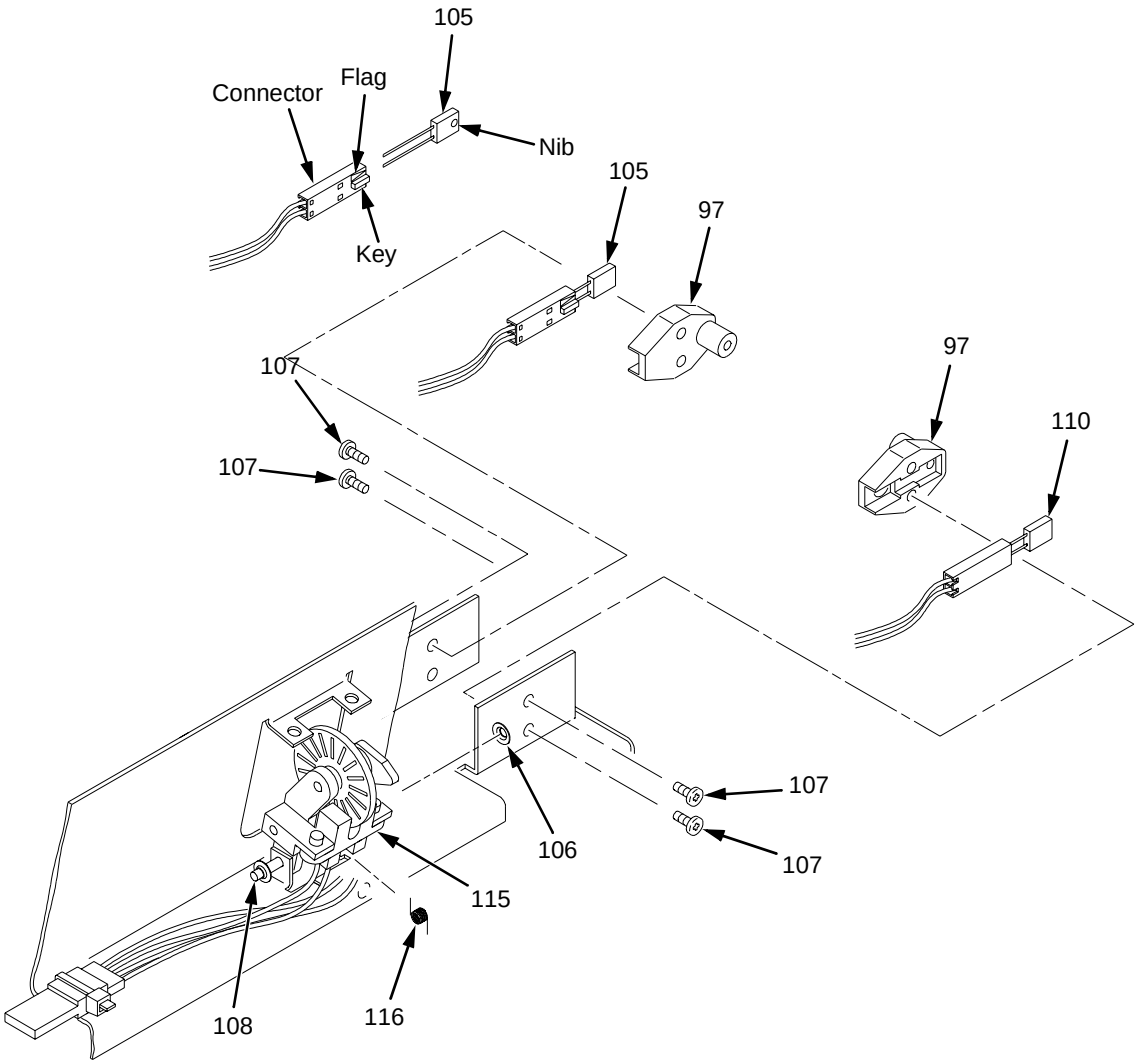


Figure 85. Stacker Detail: Paper Motion Detector

Item No.	Part No.	Description	Notes
36	164405-001	Stacker Hardware Kit	Kit not illustrated
97	158290-001	Holder, LED, Flat	
105	202728-001	Photodarlington, NPN, Rectifier	
106	202766-001	Retaining Ring, External, 0.093 inch	Part of item 115
107	Ref	Screw, Panhead, Type B, 2 x 3/16	Part of item 36
108	155025-001	Shaft, Paper Detector Switch, Long	Part of item 115
110	202729-001	LED, IR, Rectangular	
115	170289-001	Field Kit, Power Stacker, PMD	
116	111337-001	Spring, Torsion	Part of item 115

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